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# THE FAUNA OF BRITISH INDIA,

INCLUDING

## CEYLON AND BURMA.

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EDITED BY A. E. SHIPLEY, Sc.D. Cantab, HON. D.Sc. Princeton, F.R.S.

ASSISTED BY GUY A. K. MARSHALL, F.Z.S., F.E.S.

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### MOLLUSCA.

(FRESHWATER GASTROPODA & PELECYPODA.)

BY

H. B. PRESTON, F.Z.S.

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L O N D O N :

TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

CALCUTTA :  
THACKER, SPINK, & CO

BOMBAY :  
THACKER & CO., LIMITED

*March, 1915.*





PRINTED BY TAYLOR AND FRANCIS,  
RED LION COURT, FLEET STREET.

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## INTRODUCTION.

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IN collecting the materials for the following pages, the Author has been chiefly concerned in assembling, as far as possible, the original descriptions of all the freshwater species of both Gastropods and Pelecypods inhabiting the regions in question. Many of these, however, are of so short or fragmentary a nature that it has been deemed advisable either to supplant them altogether or to supplement them considerably by various notes of his own or of other writers on the subject. Moreover, even original descriptions have only been retained when printed in English or Latin, those in other languages having been either translated or rewritten.

An effort has been made to reduce all original measurements, as far as possible, to millimeters, and thus to eliminate a host of different systems ranging from English inches to German lines.

Wherever possible, illustrations of hitherto unfigured species have been given, though in a few cases, owing to the lack of authentic specimens, this has not been found practicable.

In some cases considerable difficulties have presented themselves with regard to the inclusion or rejection of certain genera which include both fresh and brackish-water forms, but generally speaking a genus has been included where members are liable, when occasion arises, to adapt themselves readily to new conditions, such, for instance, as in the case of the ponds and pools of the Gangetic Delta, which, though normally brackish, may become practically fresh through excess of rainfall after a dry season, or through the gradual silting up of the saltwater channels feeding them; in such instances the Mollusca which inhabit them will generally thrive equally well under the new conditions and become, in effect, freshwater species.

At one time it was intended to add to the present volume the terrestrial operculate genera, and a certain portion of the work was actually done when the Author was informed that this group had already been entrusted to other hands; under the circumstances the work was immediately stopped and, presumably, these families will form the subject of another volume by a different author.

It is much to be regretted that the present volume can, in most instances, only deal with the shells of the species quoted, this being largely due to the little anatomical work which has been so far done on the freshwater genera inhabiting the Indian region.

chiefly owing to the lack of properly preserved material for investigation; it may not, however, be out of place to here insert a few binomic notes which concern the families generally, these being grouped under the various headings as below:—

1. Breeding Habits.
2. Larval Stages.
3. Development from Post-Larval Stages.
4. Habitat and Mode of Life.
5. Movements, Locomotion, and Dispersal.
6. Economic Uses.

1. *Breeding Habits*.—Generally speaking the sexes in both the freshwater Gastropoda and Pelecypoda are distinct, though here and there examples of hermaphroditism are known to exist, as, for instance, in the case of certain species of *Anodonta*.

In the former case, the sexes can frequently be distinguished by the form of the shell, that of the female being of a larger size and generally more inflated than is that of the male. In the Gastropoda this is especially to be remarked in the Viviparidæ, while in the Pelecypoda it is chiefly evident in the Unionidæ, the female in this group being noticeably broader than the male.

In the fluviatile Gastropod families sexual contact usually takes place, ova as a result being deposited in the majority of instances, though in the case of the Tiaridæ and Viviparidæ, as the name of the latter would imply, the young are produced alive.

In the Pelecypoda, however, union of the sexes does not take place, the male at certain seasons in the year freely discharging the spermatozoa into the water, these being introduced into the inhalent siphons of the female by means of currents set up by ciliary movements, fertilization taking place either in the oviduct itself or else in specialized spaces of the mantle cavity.

The quantity of eggs or young produced by the different families varies enormously, this, while attaining in the Pelecypoda to thousands, and sometimes even to hundreds of thousands, as in the case of certain species of *Unio* and *Anodonta*, falls in *Planorbis* and *Limnæa* to anything from twenty to a hundred, and in *Anodonta* to such a small total as five or six only, while *Vivipara* and *Tiara* average not more than about fifteen individuals at a time.

In *Tiara* the embryos are developed in a marsupium which is formed by an infolding of the skin near the base of the right tentacle, while in the Unionidæ, Cyrenidæ, and some other Pelecypoda development takes place in the spaces between the folds of the gills where, in the Cyrenidæ, special marsupia exist for their reception.

2. *Larval stages*.—In the fluviatile Gastropoda at birth the animal is generally more or less similar to that of the half-grown or adult state, though the shell differs considerably; in the earlier stages it is exogastric or coiled forward over the head of the animal, but rapidly assumes the normal spiral of the adult. In

the hyperstroph genus *Planorbis* the embryonic shell is sinistral, becoming dextral at a very early stage of growth, though the animal remains sinistral throughout life, moreover the protoconch or embryonic shell is frequently of a horny texture, even though the later growth is of a calcareous nature, and in all cases the line of demarcation can be plainly seen between the embryonic shell and the later formed test, this line being probably caused by a rest period during which the young animal was occupied in the fuller development of other parts.

The larval stage of the freshwater Pelecypoda calls for considerable comment, so different is the embryo of the Unionidæ from the later stages of development that it was at first described as a different creature under the name *Glochidium*, a name which, though it can no longer be employed in a generic sense, is still used to differentiate it from the later stages of growth. The *Glochidium* upon its emancipation from the parent animal is a helpless creature enough, being unable to swim freely or to fend for itself in any way, indeed so helpless is it, that it must perforce become parasitic in its habits; so that it may attain this object, it is furnished with a hook-like process in the median part of the margin of each valve, which is perforate, and in addition a long byssal thread; should a fish approach, the valves are rapidly opened and shut, by which action the byssal thread is thrust forward, and should this touch the approaching fish it clings fast to it; thus attached it will generally, by the movements of the fish, be drawn into close contact with it, when the hook-like projections immediately grip the intended host beyond power of dislodgment; to allay the irritation occasioned by the adherence of the *Glochidium* the unwilling host causes a skin or cyst to form over it, and thus the embryonic naiad obtains a new home in which to continue its development, while obtaining its sustenance from the tissues of the fish. During this second period of development considerable changes take place, both the byssus and the adductor muscle are dispensed with, and in place of the latter two new adductors, together with the foot, make their appearance, a new shell is formed underlying the embryonic test, and finally the cyst is eliminated and the animal, falling from its host, begins its normal life as a free agent

*Post-larval development.*—On this subject little need be said, the Gastropods having passed the embryonic stage proceed to develop on quite normal lines, only pausing frequently for rest periods, which may be due to seasonal conditions or other causes; generally just before these periods of rest a thickening of the shell is more or less formed round the outer rim of the aperture, in some species when the new growth activity commences these thickenings are left and appear as either slight transverse ridges or sometimes varicose costulæ on the adult test, in other species upon the resumption of growth they are absorbed by the animal, the material thus secreted being doubtless used in the further building up of the shell; in a few genera, such for instance as

*Planorbis*, denticles and lamellæ are also found on the inner walls of the shell, these also being absorbed at a later stage; thus should an immature shell be split open these are often disclosed, though the inner walls of an old specimen would be quite smooth and without excrescence of any kind.

This post-embryonic shell is formed both in the Gastropods and Pelecypods of three layers, the outer or "periostracum" being formed almost entirely of "conchyolin," a chitinous substance indissoluble in water, acid, alcohol or ether; the two inner layers are composed chiefly of about 95 per cent. of calcium carbonate in the form of calcite or arragonite, the remaining parts being made up of small quantities of calcium phosphate and magnesium carbonate with a small admixture of conchyolin, this compound being known as "ostracum," and, as will be readily seen, is easily subject to erosion by reason of the extreme vulnerability of most of its component parts by acids in the water, hence the outer chitinous layer for its protection.

The progress of post-larval growth in the Pelecypods is the same, the growth markings appearing as consecutive lines or ridges; in many of the Unionidæ, and especially the Indian members of the family, the umbonal region of the shell is frequently corrugatedly sculptured, this sculpture becoming obsolete and gradually disappearing in the later formed portions of the test, though in some cases, notably of African or Far Eastern forms, the corrugated sculpture is carried on to the end.

4. *Habitat and Mode of Life*.—The habitat of the freshwater pulmonates and prosobranchs varies usually according to the genus, and even sometimes the species; thus *Hydrocena* and *Grennoconchus* are more or less amphibious dwellers in wet vegetation, clinging to the faces of rocks continually washed by the spray from waterfalls; *Theodoxis* and *Stenothyra* are inhabitants of either absolutely fresh or brackish water, and even in the case of the former, of pure sea-water, these generally requiring a rocky bottom, while the latter delight in a muddy or sandy bottom on which to crawl; the habitat of *Paludomus* is chiefly rocky mountain-streams, though the author has found more than one species plentifully occupying the muddy runlets among the paddy-fields of Ceylon.

*Tiara*, *Bithynia*, *Vivipara*, and *Pila*, as also the pulmonate genera *Limnæa* and *Planorbis*, chiefly inhabit either stagnant or slow running water, especially where decaying vegetable matter and mud are abundant.

Among the Pelecypoda the Unionidæ are chiefly, though not always, to be found on sandy bottoms in clear running water, though some species are by no means averse to an abode in the mud of pools and tanks, in which situations they lie almost buried in the sand or mud with only the posterior side and the projecting siphons showing; *Scaphula*, which is obviously a descendant from the marine *Arca*, is found not only in the brackish waters of the Gangetic and other Indian deltas but also in perfectly fresh water

a thousand miles from the coast; *Corbicula* and *Sphaerium* are generally sand or mud dwellers; while *Pisidium* largely affects running streams where there is still considerable vegetation in which to lurk.

As would be naturally supposed the waters of the plains and lower mountain-slopes are the most productive of molluscan life, though the writer was able to record some years ago the presence of *Limnæa* and *Pisidium* in Thibet at an altitude of 14,500 feet,\* this probably establishing a record for the elevation at which mollusca are known to exist, though it is only fair to state that the stream in which they were found was fed from a warm spring and was only completely frozen over in the coldest months (February to March).

The extraordinary adaptability, in adverse circumstances, of certain of the delta genera is remarkable, being able, as they are, to thrive equally well in either brackish or almost salt and perfectly fresh water as occasion arises, as is also the power of some species of both Gastropods and Pelecypods to æstivate buried deep down in almost dry mud during times of drought.

To illustrate the powers of endurance of certain species it may here be stated that *Limnæa pereger* has been known to occur in a spring in Iceland having a normal temperature of 40° Centigrade, while a species of *Paludetrina* has been taken also in a warm spring with a temperature as high as 50° Centigrade.

As far as is known, the freshwater Gastropoda are usually vegetable feeders, though some specimens of an African prosobranch (*Cleopatra*), kept alive recently by the author, eschewed oatmeal and all other vegetable food provided for them, preferring instead to devour the periostracum of one another, this cannibalistic action, however, was probably produced by the sudden change of climate and environment to which they were subjected.

The Pelecypoda, having once passed the parasitic embryonic stage, are equally vegetarian in their habits.

5. *Movements, Locomotion, and Dispersal.*—The progress of the fluviatile Gastropods is necessarily slow as they glide along on the "foot" across the mud, rocks, or up the aquatic plants on which they live, this gliding motion is caused by the alternate contracting and expanding of certain portions of the lower surface of the foot, several contractions and expansions being frequently in operation in different parts of its "sole" at the same time; in the Pelecypods, however, the causes of the mode of progression are rather different, the foot, it is true, is also used to propel the creature on its way, but the gliding motion of the Gastropods gives place to a jerky movement caused by the foot being extended, then swollen by the blood being, as it were, pumped into it, thus giving it power in its swelled condition to obtain a grasp of the object or exact spot which is to form the end of the step,

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\* Rec. Ind. Mus. Calcutta, iii, 1909, pp. 115-116.



this being accomplished by a sharp contraction of the pedal muscle, the shell and the remainder of the animal are forced suddenly forward.

Both Gastropods and Pelecypods, however, are not dependent on the foot only for voluntary movement, among the former *Limnæa* especially, and among the latter *Pisidium* are able to put forth filaments of mucous by which they are enabled to ascend and descend to and from the surface of the water and not only to float on, but to skim along it, foot uppermost.

The more or less artificial dispersal of mollusca is a subject upon which, from time to time, a good deal has been written; undoubtedly the larval Gasteropod forms are often swept many miles by floods, frequently by this means being stranded in pools and ponds isolated in normal times and to which it would necessarily be impossible for them to obtain access were it not for the agency of waterfowl which, there can be little doubt, do carry certain species about in the plumage just above the legs, considerable opportunity being given for the mollusca to ascend these and become entangled in the feathers during the lengthy periods in which the birds remain stationary in the water watching for their prey.

The Pelecypoda also are great travellers, but this is due to their being carried far in their embryonic state by the hosts to which they have attached themselves; once the parasitic larval stage is over, they are seldom able, except through an exceptional accident, to move far afield.

From the foregoing remarks, however, it must not by any means be assumed that all the fluviatile species are widely distributed, many instances occur of extremely localized forms, among which may be mentioned as examples the *Limnæa involuta* of Killarney and some of the peculiar forms of Lake Tanganyika which do not seem to have become diffused in the remainder of the Congo basin.

6. *Economic Uses.*—The purification of water is doubtless to a certain extent performed by the mollusca in their capacity of scavengers, in addition to which they also provide food for valuable birds and fish; as a rule, however, the fluviatile species are not in much request as food for man; though in Guadeloupe, Mauritius, China, Japan, and even in France, certain species of freshwater bivalves are used for human consumption.

The chief services rendered to the human race are, however, rather ornamental than actually useful; in the United States certain species of *Unionidæ* are extensively fished and even cultivated for their nacre which is used largely for button punching, small knife handles and other purposes to which mother-o'-pearl is put, while as a bi-product pearls themselves are doubtless obtained; indeed, a case has recently been placed on record of as many as nine hundred and twelve being taken from a single individual\*, one hundred of which were of marketable size, though

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\* Nantilus, Boston, Mass., xxv., p. 84.

the large majority of the remainder must have been so small as to be commercially worthless; there is no doubt, however, that the whole industry is of considerable value.

There is also a legend, which may or may not be true, that one of the reasons which tempted Cæsar to the invasion of Britain was the exaggerated stories current in Rome of the magnificent pearls produced by the river mussels of these Islands; whether this is true or not, the fact remains that, certainly up to a few years ago, the Highland peasants were in the habit of eking out their scanty incomes by fishing for *Margaritana margaritifera* in the Scottish rivers, though the pearls obtained therefrom were not of great value, they being generally small and of a dark colour; but the shell itself does not seem to have been a commercial article, possibly because of the small quantities only obtainable.

In China an extensive artificial cultivation of "blister pearls" was at one time in vogue, the mode of culture being as follows. When adult, or nearly so, a large species, *Dipsas plicata*, was selected, a wedge was placed temporarily between the valves in order to prevent their closing, while obstructions, often in the shape of small metal images of Buddha, were inserted between the mantle and the shell, generally in horizontal rows, the irritation caused by these foreign bodies in the shell induced the animal to cover them over with a layer of shelly nacre, though how long the whole operation took before they were fully and sufficiently thickly coated it is difficult to say; as many as twelve of these metal images were frequently placed in a single shell, each image measuring about 19 by 13 millimeters.

In India and the middle East, however, the author has never heard of any economic use for the freshwater mollusca, and certainly, after a sojourn of some years in Ceylon and Southern India, no case of this ever came to his notice.

In conclusion the author's thanks are due to many friends for help most willingly given in various ways, among whom may be mentioned Messrs. E. A. Smith, I.S.O., B. B. Woodward, F.L.S., and G. C. Robson, of the British Museum, Lieut.-Colonel H. H. Godwin-Austen, F.R.S., Mr. T. Iredale, and especially to Dr. N. Annandale of the Indian Museum, Calcutta, who has been kind enough to place the whole of the Indian Museum Collection of Naiades at his disposal in order to assist him in his work.

To Mr. Forster Cooper, of the Museums at Cambridge, the author is also indebted for the loan of certain specimens from the Benson Collection for purposes of figuring.

Further, the author would wish to acknowledge the help afforded to him in compiling the above binomic notes by Mr. B. B. Woodward's admirable book 'The Life of the Mollusca.'



# MOLLUSCA.

## Class GASTROPODA.

### Order SCUTIBRANCHIATA.

#### Suborder RHIPIDOGLOSSA.

#### Family HYDROCENIDÆ.

#### Subfamily HYDROCENINÆ.

Shell globose, imperforate, small; operculum calcareous, with concentric striæ.

*Distribution.* S.E. Europe; S. Asia; Malaysia; S. Africa.

#### Genus HYDROCENA.

*Hydrocena*, Parreyss, 1846, Hermannsen's *Indicis Generum Malac.* i, p. 546.

TYPE, *H. cattaroensis*, Pfeiffer; Dalmatia.

*Range.* S.E. Europe; S. Asia; Malaysia; S. Africa.

Shell small, thin, imperforate, with few volutions; whorls convex; aperture oval, angled at the base; labrum having the margins joined by a light parietal callus, not reflexed, acute; operculum subconcentric, outwardly spirally striate.

#### Subgenus GEORISSA.

*Georissa*, W. Blanford, A. M. N. H. ser. 3, xiii, 1864, p. 463.

TYPE, *Hydrocena pyxis*, Benson; Burma.

*Range.* India; Malaysia.

*Original description*:—Testa imperforata vel vix perforata, minima, conica, succinea vel rubella, plerumque spiraliter sulcata vel striata.

Operculum semiovale, sine ullo vestigio structuræ spiralis, ex-centrice striatum, testaceum, transparens.

Animal parvum, lobis hemisphæricus in loco tentaculorum munitum.

Oculi normales. Pes brevis, rotundatus.

1. *Hydrocena* (*Georissa*) *saritta* (*Benson*).

*Hydrocena* (*Georissa*) *saritta* (*Benson*), A. M. N. H. ser. 2, viii, 1851, p. 188 (as *Cyclostoma*); Pfeiffer, Mon. Pneum. i, p. 314 (as *Cyclostoma*); H. & T., C. I. pl. 117, fig. 2 (as *Hydrocæna*).

*Original description*:—Testa subimperfiorata, ovato-conica, liris spiralibus crebris, sulcis angustis divisis, munita, ferrugineo-albida, apice rubente, sutura bene impressa, apice obtuso; anfractibus 4 valde convexis; apertura vix obliqua, ovata,  $\frac{3}{8}$  longitudinis æquante, peristomate acuto, expansiusculo, marginibus disjunctis, columellari superne angulato, pariete calloso.

Alt. 2, diam. 1.25 mm.

*Hab.* Cherra Poonjee, Garo Hills.

2. *Hydrocena* (*Georissa*) *liratula*, *Stoliczka*.

*Hydrocena* (*Georissa*) *liratula*, *Stoliczka*, J. A. S. B. xl, 1871, pt. 2, p. 157, pl. 6, fig. 6.

*Original description*:—Testa globoso-conica, solida, imperfiorata, carneo-luteola; anfractibus 3–3½, convexis, sutura profunda simplici junctis, primo apicem subobtusum formante mammillato, lævigato, luteolo vel rubescente, cæteris supra (infra suturam) paululum depressiusculis, spiraliter liratis, liris acutis, simplicibus fere æquidistantibus, in anf. penultimo 6–7, in ultimo 9–10, basi convexa, centraliter minute multistriata; apertura semilunari, altitudine fere spiram æquante, haud dilatata; labro simplici, curvato, intus striato, labio incrassato, albido, adnato, intus rectiusculo, lævi. Operculum testaceum, tenue, diaphanum, latiuscule semilunare (nucleo excentrico), striis incrementi rugulosis vestitum, intus ad nucleum appendice tenui, longo, lateraliter sub marginem columellarem projiciente, instructum.

Alt. 2.2, alt. ult. anf. ad aperturam fere 1, diam. maj. 1.8, diam. min. 1.5 mm.

Aperture: diam .7 mm.

*Hab.* Damotha, near Moulmein.

Animal sordide rubescente albidum, rostro lato, nigricante tentaculis brevissimis, vix projicientibus, latis, medio fere confluentibus, oculos parvos supra, ad basin et paulo lateraliter sitos, gerentibus; pede breve, subovato pallido.

“ . . . . It is mostly allied to the Khasi hill species *G. saritta*, Bens., but is more globose and a little more numerously spirally ribbed. . . . ”

3. *Hydrocena* (*Georissa*) *illex* (*Benson*).

*Hydrocena* (*Georissa*) *illex* (*Benson*), A. M. N. H. ser. 2, xvii, 1856, p. 231 (as *Hydrocæna*); Pfeiffer, Mon. Pneum. ii, p. 161 (as *Hydrocæna*); H. & T., C. I. pl. 117, fig. 4 (as *Hydrocæna*).

*Original description*:—Testa vix perforata, ovato-acuta, minutissime striata, spiraliter confertim tenuisulcata, succinea, trans-

lucente, versus spiram rubello-fusca, spira nitida, elongato-conica, sutura profunda, apice obtusiusculo; anfractibus 4 valde convexis, ultimo  $\frac{1}{3}$  totius testæ superante; apertura obliqua, ovata, superne angulata, peristomate tenui, non continuo, marginibus conniventibus, dextro recto acuto, columellari reflexiusculo. Operculo tenui, corneo, pellucido, pauci-spirato, nucleo basali.

Alt. 2.65, diam. 1.65 mm.

Hab. Phie Than, Tenasserim, adhering to stones.

"Nearly allied to *Hydrocena* (*Cyclostoma*) *saritta*, nobis, . . . . but more slender in form."

#### 4. *Hydrocena* (*Georissa*) *pyxis* (*Benson*).

*Hydrocena* (*Georissa*) *pyxis* (Benson), A. M. N. H. ser. 2, xvii, 1856, p. 232 (as *Hydrocena*); Pfeiffer, Mon. Pneum. ii, p. 161 (as *Hydrocæna*); H. & T., C. I. pl. 117, fig. 3 (as *Hydrocena*).

*Original description*:—Testa obtecte perforata, ovato-conica, spiraliter sulcata, succinea, translucida, spiram versus rubente; spira conica, sutura profunda, apice obtuso; anfractibus 4 convexis, ultimo  $\frac{2}{5}$  totius testæ æquante; apertura obliqua, semicirculari, peristomate tenui, acuto, non continuo, margine columellari expanso, reflexiusculo. Operculo — ?

Alt. 1.5, diam. 1.25 mm.

Hab. Thyet-Mio.

"*H. pyxis*, although smaller than *H. illex*, is more coarsely sulcate, and the furrows on the lower whorl are more distant near the suture than below."

#### 5. *Hydrocena* (*Georissa*) *fraterna*, *Theobald* & *Stoliczka*.

*Hydrocena* (*Georissa*) *fraterna*, Theobald & Stoliczka, J. A. S. B. xli, 1873, pt. 2, p. 332, pl. 11, figs. 5, 6.

*Original description*:—Testa cylindræo conoidea, solidula, pallida, imperforata, regione umbilicali paulo impressa; anfractibus  $3\frac{1}{2}$ , convexis, supra modice subtruncatis, sutura per-profunda junctis, spiraliter crasse liratis, liris in anfractu penultimo quinque, supera a sutura remotiuscula: apice valde mamillato; ultimo anfractu spira brevior, basi convexiusculo, spiraliter striato; apertura fere semicirculari, labro simplici, antice modice recedente, margine subobtusato instructo, labio recto, incrassato; operculo testaceo, tenui, subdiaphano, paucispirato.

Alt. 1.4, diam. maj. .95 mm.

Hab. Ataran River Valley, near Moulmein.

"Allied to *G. pyxis* in having the uppermost spiral ridge on the whorls somewhat remote from the suture, but the ridges themselves are stronger, the whorls somewhat less numerous, the apex very distinctly mamillate, and the entire form of the shell more slender and cylindrical."

6. *Hydrocena* (Georissa) *frustillum* (Benson).

*Hydrocena* (Georissa) *frustillum* (Benson), A. M. N. H. ser. 3, vi, 1860, p. 193 (as *Hydrocena*); Pfeiffer, Mon. Pneum. iii, p. 251; H. & T., C. I. pl. 117, fig. 5 (as *Hydrocæna*).

*Original description*:—Testa imperforata, ovato-oblonga, solidiuscula, spiralter confertissime tenuisulcata, succinea?; spira subpyramidata, apice obtusiusculo, sutura impressa; anfractibus 5, convexis, ultimo  $\frac{2}{3}$  testæ subæquante; apertura obliqua, truncato-ovata, superne necnon ad latus sinistrum angulata, peristomate tenui, non continuo, pariete calloso. Operc. —?

Alt. 2.5, diam. 1.75 mm.

*Hab.* Ava.

Differing from *G. illex* (Benson), "in the absence of the very elongate slender spire of that species, in the want of an umbilicus, and in the form of the aperture, which presents internally an angle at the junction of the columellar lip."

7. *Hydrocena* (Georissa) *rawesiana* (Benson).

*Hydrocena* (Georissa) *rawesiana* (Benson), A. M. N. H. ser. 3, vi, 1860, p. 193 (as *Hydrocena*); Pfeiffer, Mon. Pneum. iii, p. 252; Theobald & Stoliczka, J. A. S. B. xli, 1872, pt. 2, p. 332; H. & T., C. I. pl. 117, fig. 6 (as *Hydrocæna*).

*Original description*:—Testa imperforata, subgloboso-conica, solida, confertum spiralter striata, luteo-albida; spira conica, apice obtuso, sutura profundiuscula; anfractibus 4, valde convexi-, ultimo spiram subæquante; apertura vix obliqua, semicirculari, superne et ad latus sinistrum angulata, peristomate tenui, margine parietali calloso, intus recto, stricto; loco umbilicali subfoveato. Operc. —?

Alt. 2, diam. 1.5 mm.

*Hab.* Near Moulmein in the Farm Caves.

"The shell is more globose than that of *H. pyxis*, Benson, and the sculpture is altogether different. In the formation of the aperture there is an approach to that of *H. frustillum*, but it exhibits a straight knife-like edge at the internal parietal margin."

8. *Hydrocena* (Georissa) *blanfordiana*, Stoliczka.

*Hydrocena* (Georissa) *blanfordiana*, Stoliczka, J. A. S. B. xl, 1871, pt. 2, pp. 157-158, pl. 6, fig. 6; xli, 1873, pt. 2, p. 332; H. & T., C. I. pl. cxvii, fig. 2 (as *Hydrocæna*).

*Original description*:—Testa globoso conoidea, imperforata, moderate solidula, luteola, apice rubescente, mammillato lævissimo; anfractibus  $3\frac{1}{2}$ , convexiusculis, transversaliter striis incrementi minutis tectis, sublævigatis; ultimo ad peripheriam rotundato, in altitudine spiram subæquante; apertura late semilunari; labro,

uniforme curvato, postice (vel supra) angulata, labio incrassato, levissime arcuato, supra paululum dilatato, infra angustiore.

Alt. 1.8, alt. ult. anf. ad apert. .8, diam. maj. 1.2, diam. min. 1 mm.

Aperture: diam. .5 mm.

*Hab.* Farm Caves, near Moulmein.

## Family NERITIDÆ.

### Subfamily NERITINÆ.

Shell imperforate, subglobular or subpatelliform; operculum calcareous, the internal surface furnished with projecting apophyses, the internal margin being thus articulated to the columellar septum.

*Distribution.* Temperate and Tropical Regions of the World.

#### Genus THEODOXIS [*Neritina*].

*Theodoxis*, de Montfort, *Conch. Syst.* ii, 1810, p. 350.

*Neritina*, Lamarck, 1822 [*Neritine*, 1809].

TYPE, *T. lutetianus*, de Montfort (*Fluvialis*, Linn.); Europe.

*Range.* Temperate and Tropical Regions of the World.

Shell globular, oval, or turriculated, smooth or spirally striated, often adorned with vivid and varied colours; inner lip septiform, crenulated, rarely simple.

#### 9. *Theodoxis perotetiana* (Récluz).

*Neritina perotetiana*, Récluz, *Rev. Zool. Cuv.* 1841, p. 333; Sowerby, *Thes. Conch.* ii. pl. 115, figs. 200, 201; Reeve, *Con. Icon.*, *Ner.* sp. 124; H. & T., *C. I.* pl. 157, figs. 2, 3.

*Original description*:—Testa ovato-semiglobosa, fusco-nigricante, tenuissime striata; anfractibus tribus. ultimo superne coarctato; spira brevi, convexa, obtusata; apice pallido, sub-hyalino; apertura extus rotundata; labio plano, albido, in medio vix arcuato obsoleteque crenato.

Alt. 9, diam. 11 mm.

*Hab.* Streams of the Nilgherries.

*T. ceylonensis* (Récluz), *J. Conch.* 1851, p. 202, appears to be a variety having an orange edge to the otherwise black operculum.

#### 10. *Theodoxis fuliginosa* (Theobald).

*Neritina fuliginosa* (Theobald), *J. A. S. B.* xxvii, 1859, p. 315.

*Neritina reticularis*, var. *capillulata*, Sow. *Thes. Conch.* ii, pl. 156, figs. 265, 266; H. & T., *C. I.* pl. 157, figs. 8, 9.

*Original description*:—Testa neritinæformi, subglobosa, spira



minima; colore luteo-flavescente rubro reticulata; intus flavescente-pallida; aliquando cærulescente; non raro fasciis duobus cincta in apertura facilius visis. Epidermide plerumque nigro colore, extraneo fucato; semipolita, operculo pallide aurantiaco, margine anteriore rubro.

Alt. 12·5, diam. 12·5 mm. (from fig. 266 in Thes. Conch.).

Hab. Burma, near Amrapoora.

# 11. *Theodoxis reticularis* (Sowerby).

*Theodoxis reticularis* (Sowerby) (for *Neritina reticulata*, Bens. not Sow. in P. Z. S.), Conch. Illust., *Ner.* fig. 44; Thes. Conch. ii. p. 536, figs. 264, 265; H. & T., C. I. pl. 157, figs. 5, 6.

*Neritina humeralis*, Th. (name only).

*Original description*:—Testa subconica, lævi, pallide fulva, rufescente, epidermide tenui, subviridi induta, lineis angulatis transverse reticulata; spira plerumque exsertiuscula, apice subcomplanato, anfractu ultimo, supra suturam angulatim elevato, infra medium ventricosum; apertura subcontracta, labio externo superne declivo, infra medium productum; columella tumida, margine sublævigato.

Alt. 15, diam. maj. 15 mm. (from fig. 264 in Thes. Conch.).

Hab. Calcutta.

# 12. *Theodoxis obtusa* (Benson).

*Neritina obtusa*, Benson, in Sow. Conch. Illust., *Ner.* fig. 43; Thes. Conch. ii. p. 517, pl. 111, figs. 72, 73.

*Neritina spiralis*, Reeve, Conch. Icon., *Ner.* fig. 99 (from type); H. & T., C. I. pl. 157, fig. 7.

*Original description*:—Testa transverse ovali, leviter striata, epidermide subviridi induta; spira depressa, anfractibus duobus; apertura magna, subcinerea; labio externo interne crassiusculo; labio interno complanato, recedente, margine sinistro oblique acuto, margine dextro in medio subarcuato, subcrenulato. Operculo cinereo.

Alt. 10, diam. maj. 12·5 mm. (from fig. 72 in Thes. Conch.).

Hab. Banks of the Ganges, Calcutta.

## Genus SEPTARIA.

*Septaria*, Férussac, Essai Méth. Conch., Paris, 1807, p. 61.

*Navicella*, Lamarck, 1809.

*Cimber*, de Montfort, 1810.

*Sandalum*, pars, Schumacher, 1817.

*Catillus*, Humphrey, 1797, fide Swainson, 1840.

TYPE, *Patella porcellana*, Linn.: Islands of Bourbon, Rodriguez, Mauritius, and Madagascar.

Range. S. Asia; N. Australia; Malaysia; Tropical Islands of Indian and Pacific Oceans.

Shell oblong-ovate, depressed, Patella-shaped, sometimes concentrically striated, more frequently smooth, olive-yellow or greenish, generally reticulated with black, no spire, vertex rather obliquely inflected, sometimes beaked, lip simple, columellar area thin, flat, septum-like, aperture very large, muscular impressions two, distinct. Operculum testaceous, nearly square, flat, with a sharp tooth at the side. (Reeve.)

### 13. *Septaria reticulata* (Reeve).

*Septaria reticulata* (Reeve), Conch. Icon., *Navic.* pl. 5, figs. 20 *a, b*, & pl. vi, figs. 26 *a, b* (as *Navicella eximia*); H. & T., C. I. pl. 137, figs. 5, 6.

*Original description*:—Shell depressly ovate, thin, semitransparent, yellowish, tinged with rose towards the apex, openly reticulated with olive-black, columellar area small.

Diam. maj. 20, diam. min. 13 mm. (from fig. 20 *a* in Conch. Icon.).

Diam. maj. 31, diam. min. 20.5 mm. (from fig. 26 *b* in Conch. Icon.).

*Hab.* Ceylon.

### 14. *Septaria compressa* (Benson).

*Septaria compressa* (Benson), J. A. S. B. v, 1836, p. 749.

*Navicella lineata*, var., Sow. Thes. Conch. ii, pl. 118, fig. 25; H. & T., C. I. pl. 137, figs. 1, 4.

*Original description*:—Testa transverse elongata, compressa, lutea, albida, vel cornea, lineis munitissimis transversis diverse coloratis, maculisque alternatis radiantibus decoloratis picta; dorso elevato; limbi extremitatibus emarginatis.

Diam. maj. 21.25, diam. min. 11.25 mm.

*Hab.* Hooghly River.

Generally found adhering to the stems of shrubs growing in the water.

### 15. *Septaria cærulescens* (Sowerby).

*Septaria cærulescens* (Sowerby), Thes. Conch. ii, p. 550, pl. 118, fig. 29, & pl. 118 bis, figs. 36, 37, 38; Reeve, Conch. Icon., *Navic.* pl. 7, fig. 29.

*Navicella orientalis*, Reeve, loc. cit. fig. 33 (young).

*Navicella tessellata*, Benson (not well of Lam.), J. A. S. B. v, 1836, p. 750; H. & T., C. I. pl. 137, figs. 2, 3, 7, 10.

*Original description*:—Testa breviuscula, subdepressa, subquadrata, cærulea, maculis nigris angulatis picta; margine apicem superante; septo angustissimo, arcuato.

Diam. maj. 17.5, diam. min. 12.5 mm. (from fig. 29 in Thes. Conch.).

*Hab.* River Ganges, Bengal.

16. *Septaria livesayi* (Dohrn).

*Septaria livesayi* (Dohrn), P. Z. S. 1858, p. 135 (as *Navicella*);  
H. & T., C. I. pl. 137, figs. 8, 9.

*Original description*:—Testa oblongo-ovata, tenuis, parum pellucida, fusco-viridis, ad apicem rubescens, maculis triangularibus luteis ornata; apex ad dextram spectans, prominulus; apertura alba.

Alt. 6, diam. maj. 35, diam. min. 15 mm.

Aperture: diam. 18 mm.

*Hab.* Ceylon.

17. *Septaria squamata* (Dohrn).

*Septaria squamata* (Dohrn), P. Z. S. 1858, p. 135; H. & T., C. I. pl. 157, figs. 1, 4 (as *Navicella*).

*Original description*:—Testa ovata, tenuis, pellucida, fusco-viridis, ad apicem rubescens, maculis luteis squamæformibus, striis fulguratis et maculis nigrescentibus picta; apex ad sinistram spectans, marginalis; apertura alba.

Alt. 5·5, diam. maj. 18, diam. min. 12·5 mm.

Aperture: diam. 15 mm.

*Hab.* Ceylon.

## Order PECTINIBRANCHIATA.

## Suborder TÆNIOGLOSSA.

Family TIARIDÆ [= *Melaniidæ*].

## Subfamily TIARINÆ.

Shell ovately or subulately fusiform, smooth, striate costulate or spinously nodulate.

*Distribution.* S.E. Europe; S. & E. Asia; N. Australia; Africa; America; Tropical Islands of Indian and Pacific Oceans.

## Genus FAUNUS.

*Faunus*, de Montfort, Conch. Syst. 1810.

*Pirena*, Lamarck, 1822.

*Melanamona*, Bowditch.

*Type*, *Strombus ater*, Linnaeus: Moluccas; New Guinea; New Ireland; Java; Philippines; Timor, Buru, Amboyna; Ceylon.

*Range.* The above Islands and also New Caledonia; Penang; China.

Shell subulate, acuminate; columella smooth, arched, extending into a parietal callus; aperture ovate, having an anterior canal at the base.

# 18. *Faunus ater* (Linnaeus).

*Strombus ater*, Linn. Syst. Nat. xii, p. 1213, no. 516; Rumph. Amb. pl. 30, fig. R; Chemn. pl. 135, fig. 1227.

*Nerita atra*, Mull. Verm. no. 375; Schroter, Flussconch. p. 371.

*Strombus atropurpureus*, Schroter, Flussconch. p. 372.

*Strombus dealbatus*, Gmel. no. 46, p. 3523; Seba, Mus. pl. 56, figs. 13, 14.

*Cerithium fluviatile*, Fér. Syst. Conch. p. 69, no. 1.

*Melanamona*, Bowditch, Elem. Conch. pl. 6, fig. 19.

*Pirena atra* (L.), Mousson, Moll. Java, pl. 10, fig. 1; Reeve, Conch. Icon. fig. 5.

*Faunus ater* (L.), H. & A. Ad., Gen. of Rec. Moll.; Gray, Guide Syst. Distrib.; Chemn. Man. Conch. fig. 2080.

*Melanopsis atra* (L.), Fér. Monogr. Melanops. pl. 2, fig. 7, p. 32; Sow. Gen. of Shells, fig. 1; Deshayes, Encycl. Méth., Verm. ii, p. 337, no. 11.

*Pirena terebralis*, Lam. Anim. s. Vert. no. 1; Quoy & Gaimard, Voy. Coquille, ii, p. 360; Sowerby, Conch. Man. fig. 316; Brot, Matér. iii, p. 23.

*Pirena picta*, Reeve, Conch. Icon. fig. 3.

*Buccinum acicula*, Gmel. p. 3503; Lister, Conch. pl. mlv, fig. 7.

*Pirena acus*, Lesson, Voy. Coquille, ii, p. 360.

*Melanopsis atra*, Pot. & Mich. Gal. pl. 31, figs. 7, 8.

*Melanopsis princeps*, Lea, Trans. Am. Phil. Soc. v, pl. 19, fig. 74; Lea, Obs. Gen. *Unio*, i, p. 194, pl. 19, fig. 74.

*Faunopsis princeps* (Lea), Gill, Proc. Ac. N. S. Phil. 1863 (Monstr.).

*Pirena pagodus*, Reeve, Conch. Icon. fig. 4.

*Faunus ater*, Linn., Nevill, Hand List, ii, p. 217.

Shell sharply elongately tapering, intense black, obscurely minutely yellow-mottled; whorls twenty or more, concavely flattened, densely minutely wrinkle-striated; aperture small, columellar margin callously incurved. (Reeve.)

Alt. 84, diam. 19 mm. (Reeve, Conch. Icon. fig. 5).

*Hab.* Ceylon; Nicobars?; Moluccas; New Ireland; Penang; Java; Philippines; Timor; Buru; Amboyna; Celebes, etc.

*Var. perdecollata*, Nevill, Hand List, pt. 2, p. 218.

"Apparently a form constantly characterized by the strong decollation, erosion of the surface and iron-rust, reddish colour of the peristome, etc. . . . . Very variable in size." (Nevill.)

Alt. 76.5, diam. 21 mm.

*Hab.* Ceylon, Southern Province (Nevill).

Genus **TIARA**.

*Tiara*, Bolten, 1798, Mus. Bolten.

*Melania*, Lamarck, 1799 et auct.

*Turritella*, Link, non Lamarck.

*Ellistoma*, Rafinesque.

*Melanites*, Krugel.

*Hygronoma*, Gistel.

TYPE, *Helix amarula*, Linn.: Mauritius; Madagascar; Comoro Islands.

Range. Tropical Islands of the Indian Ocean and Moluccas.

Shell ovate; spire and aperture of nearly equal length; whorls coronated with spines or tubercles; aperture ovate, entire in front, pointed behind; inner lip very thin; outer lip simple, acute.

19. *Tiara cybele* (Gould).

*Tiara cybele* (Gould), Proc. Boston Soc. Nat. Hist. ii, 1847, p. 222 (as *Melania cybele*).

*Melania crenularis*, Deshayes, Mag. Zool. 1884, pl. 83; Nevill, Hand List, pt. 2, p. 279.

Original description:—Testa ovata, turrita, crassa, fuliginosa, epidermide velutina induta; spira ad apicem valde erosa, anfr. superstit. ad 3 planulatis, superne tribulatis, et pinnis curtis acutis arrectis ordinatim dispositis coronatis; apertura angusta, elongato-ovalis, postice angulata; intus livida.

Alt. 25, diam. 15.5 mm.

Hab. Fiji, Navigators' Islands, etc.

Var. *amara* (Mörch), J. de Conch. 1872, p. 319, as *Melania amara*, for *M. mitra*, Reeve (not of Meuschen), Con. Icon. sp. 175.

Original description:—Shell ovate, ventricose, black-brown, sometimes covered with a soft epidermis; whorls few, smooth, sharply concavely angled at the upper part, prickly-tubercled at the angle; aperture obliquely ovate; columella callously effused, interior sometimes blood-stained.

Alt. 47, diam. 24.5 mm. (fig. b in Conch. Icon.).

Hab. Sumatra (Cuming); Pulo Panjang (Mörch); Great Nicobar (Roepstorff).

*Melania*, Lamarck, being an absolute synonym of *Tiara*, Bolten, and as none of the names used in the genus appear to be applicable, the author proposes the subgeneric name *Radina* for the following group.

Subgenus **RADINA**, nov.

*Melania*, H. & A. Adams, 1855; Brot, 1874.

TYPE, *Melania hastula*, Lea: Philippines; Fiji; Halmahera; Aru Islands.

*Range.* S. & E. Asia; Malay Archipelago; islands of the Pacific.

Shell subulate, elongated; spire many-whorled, acute; whorls smooth, not spinose; aperture ovate, acuminate, posteriorly entire, rounded in front; inner lip thin, not callous; outer lip simple, acute, margin entire. (*H. & A. Adams.*)

20. *Tiara (Radina) hastula (Lea).*

*Tiara (Radina) hastula* (Lea), P. Z. S. 1850, p. 189; Conch.-Cab. ii, pl. 16, figs. 3, 3 b; fide Brot.

*Melania costata*, auct. [not of Quoy].

*Melania flammulata*, Busch [not of Reeve].

*Melania picta*, Rve. [not of Hinds].

*Melania acuta*, Rve. [not of Lea].

*Melania arroensis*, Rve., Nevill, Hand List, pt. 2, p. 228.

*Original description*:—Testa striata, nonnunquam plicata, elongata subulata, diaphana, tenui, fusca, striis transversis crebris costulas decussantibus; spira acuminata; suturis linearibus; anfractibus plano-convexis; apertura parvula, ovata, intus vel fusca vel albida; columella incurva tortaque.

Alt. 83, diam. 20·25 mm.

*Hab.* Philippines; India.

Var. *subacutissima*, Nevill, tom. cit.

“..... Spiral striation on base of last whorl distinct: upper whorls obscurely dotted and flamed with brown and peculiarly alternate ....”

Alt. 55, diam. 16 mm.

*Hab.* Andamans (*Roepstorff*).

Subvar. *subcrenulata*, Nevill, tom. cit. p. 229.

Alt. 51, diam. 16·75 mm.

*Hab.* Andamans (*Roepstorff*).

21. *Tiara (Radina) crenulata (Deshayes).*

*Tiara (Radina) crenulata* (Deshayes), Lamarck, Hist. Anim. s. Vert. ed. 2, viii, 1838, p. 434.

*Bulimus torulosus*, Brug. Encycl. Méth., Vers, i, p. 352?

*Helix crenata*, Dillwyn, Cat. ii, p. 950, no. 144; Nevill, Hand List, pt. 2, p. 225.

*Original description*:—Testa elongato-turrita, apice truncata albo-fuscescente obsolete sulcata; anfractibus latis subplanis ad suturam depressis, marginatis; margine lato, excavato; apertura magna, ovali, ad basim dilatata; columella contorta, crassa.

Alt. 64, diam. 21 mm.

*Hab.* Philippines.

Var. *tirouri*, *Férussac*, Quoy & Gaim. Voy. de l'Astr., Zool. iii, p. 159, pl. lvi, figs. 38, 39 (as *Melania tirouri*); Nevill, Hand List, pt. 2, p. 226.

*Original description*:—Testa turrita, solida, crassa, rudenter transversim sulcata, albida; anfractibus plano-convexis; postice sulco impresso divisus; spira crassa, truncata; apertura ampla, ovali et cærulea.

Alt. 54 mm.

*Hab.* Celebes; Philippines; Puniar River, Cuddalore (*Bedalome*), Vizagapatam (*Stoliczka*); Andamans (*Roepstorff*).

Var. *confusa*, *Dohrn*, Nevill, Hand List, pt. 2, p. 225.

*Melania confusa*, *Dohrn*, P. Z. S. 1858, p. 135; H. & T., C. I. pl. 72, fig. 4.

*Original description*:—Testa turrita, solida olivacea vel nigricans; anfr. 10–11 planulati, spiralisulcati aut varicosi, longitudinaliter striati; apertura oblonga, albida, non detruncata. Operculum corneum, nigrescens, oblongum.

Alt. 72, diam. 18 mm.

Aperture: alt. 22, diam. 11 mm.

*Hab.* Ceylon.

## 22. *Tiara* (*Radina*) *clavus*, *Lamarck*.

*Tiara* (*Radina*) *clavus* (*Lamarck*), Hist. Anim. s. Vert. vi, 1822, p. 165.

*Melania acuminata*, *Dkr. Phil. Abb.*

*Melania acus*, *Lea*, P. Z. S. 1850; *Reeve*, Con. Icon. fig. 92.

*Melania gaudiosa*, *Hinds*, A. M. N. H. xiv, 1844; *Nevill*, Hand List, pt. 2, p. 223.

Shell shortly subulate, spire sharply acuminate towards the apex, horny, rather thin, livid purple, white at the sutures; whorls twelve to thirteen, rather flat, the first longitudinally ribbed, the rest smooth; aperture ovate, columellar margin callous white.

Alt. 25, diam. 85 mm. (*Reeve*, Con. Icon. fig. 92 as *M. acus*, *Lea*.)

*Hab.* Nicobars (*Nevill*).

Var. *sobrius*, *Lea*.

*Melania sobrius*, *Lea*, P. Z. S. 1850, p. 181, and *Reeve*, Con. Icon. figs. 82, 80; *Nevill*, Hand List, pt. 2, p. 223.

“..... of a plain uniform colouration, without traces either of spots or bands.” (*Nevill*.)

Alt. 31.5–39.5, diam. 10–12.75 mm.

*Hab.* Nicobars.

Subvar. *cochlidium*, *Lea*.

*Melania cochlidium*, Lea, P. Z. S. 1850, p. 183, Reeve, Con. Icon. fig. 27; Nevill, Hand List, pt. 2, p. 224.

*Original description*:—Testa lævi, subulata, subcrassa, rufo-cornea; spira elevata, acuminata, ad apicem minute plicata; suturis regulariter impressis; anfractibus tredecim, subcompressis, anfractu ultimo supra angulato, magno; apertura late ovata, parva, ad basim retusa, intus albida; columella regulariter incurva.

Alt. 37·5, diam. 12·5 mm.

*Hab.* Philippines; Katchall, Nicobar Islands (*Roepstorff*).

Var. *pirenoidea*, *Nevill*, Hand List, pt. 2, p. 224.

“A remarkable, ‘Pirena-like,’ strongly decollate and massive form, . . . .” (*Nevill*.)

Alt. 30, diam. 12 mm.

*Hab.* Nicobars.

Subvar. *perdecollata*, *Nevill*, tom. cit.

A smaller form, still more decollate, only two or three whorls remaining.

*Hab.* Nicobars.

Var. *plana*, v. d. *Busch*, MS., *Brot*, Conch.-Cab. ii, pl. 21, fig. 17 a.

? *Melania gaudiosa*, Hinds, Nevill, Hand List, pt. 2, p. 225.

“The apical eight whorls are very prominently and regularly, longitudinally ribbed and spirally striated; last whorl, of course, smooth at base; of uniform dark olive-green colouration.” (*Nevill*.)

Alt. 28·5, diam. 7·75 mm.

*Hab.* Great Nicobar.

23. *Tiara* (*Radina*) *fuscata* (*Born*).

*Tiara* (*Radina*) *fuscata* (*Born*), Test. Vindob. 1780, p. 390 (as *Helix*) [not of the Con. Indica], and Test. Mus. Caesar. Vindob. pl. 16, fig. 17; Nevill, Hand List, pt. 2, p. 221.

*Original description*:—Testa subulata, lævis, transversim subtilissime striata; anfractus decem teretes; apertura ovata; labrum læve; faux cinerea; color e luteo fuscus.

Alt. 48, diam. 15 mm.

*Hab.* Nicobars.

24. *Tiara* (*Radina*) *zeleborii* (*Brot*).

*Tiara* (*Radina*) *zeleborii* (*Brot*), Mat. Mélaniens, iii, p. 35, pl. 2, figs. 13, 14; Nevill, Hand List, pt. 2, p. 230.

*Original description*.—Testa subulata, solida, fusco-nigra, polita;



spira eroso-decollata (specim. adult.); anfract. 5-6 incolumes subplanulati, lævigati, sutura subcanaliculata, angusta marginata divisi, ultimo magno, basi obtuse angulato, circa columellam striato. Apertura piriformis, superne acute angulata, basi producta, late effusa, columella torta, margine dextro recto, basali arcuato. Opercul. subspiratum, nucleo basali, marginali.

Testa juvenilis spira subintegra, colore fusco-corneo; anfr. ultimus basi angulatus, parte mediana fusco tinctus. Anfr. circa 11, supremi longitudinaliter crebre striati, striis sensim evanescentibus.

Dim. specim. adult. decollati (anfr. 5-6).

Alt. 54, diam. 13 mm.

Aperture: alt. 18, diam. 10 mm.

Dim. specim. juv. (anfr. circa 11).

Alt. 37, diam. 8 mm.

Hab. Nicobars (*Roepstorff*).

Var. *nana*, *Nevill*, tom. cit.

"Strongly decollate, only 3 or 4 whorls remaining."

Alt. 29.5, diam. 10.5 mm.

Hab. Great Nicobar (*Roepstorff*).

Var. *solidiuscula*, *Nevill*, tom. cit.

"A very distinct variety, slightly decollate, 6 whorls . . . . . ; constantly distinguished from . . . . . the preceding by its greater solidity and by the less convex whorls, especially noticeable in the last one."

Alt. 37, diam. 11.5 mm.

Hab. Andamans (*Roepstorff*).

## 25. *Tiara (Radina) charon* (*Preston*).

*Tiara (Radina) charon* (*Preston*), Rec. Ind. Mus. ii, p. 196, pl. 15, fig. 22.

Shell elongately subulate, dark brownish black; remaining whorls 12, convex, marked throughout with lines of growth and spirally sculptured with faint, somewhat distant raised striæ; sutures well impressed; columella descending in a rounded curve and extending into a slight callus which reaches the lip above; peristome simple; aperture oblong-ovate; interior slate-colour.

Alt. 56, diam. maj. 12 mm.

Aperture, alt. 11.75, diam. 7 mm.

Hab. Andaman Islands.

## 26. *Tiara (Radina) expatriata* (*Preston*).

*Tiara (Radina) expatriata* (*Preston*), Rec. Ind. Mus. ii, p. 196, pl. 15, fig. 23.

Shell subulately turreted, dark blackish brown; remaining whorls  $4\frac{1}{2}$ , spirally striated on the lower half of the upper whorls;

the body-whorl encircled by an infra-sutural ridge forming a distinct shoulder and weakly spirally lirata throughout below the ridge; sutures impressed; peristome simple; columella arched, a callus joining it with the lip above; aperture inversely auriform.

Alt. 33.25, diam. maj. 12.25 mm.

Aperture, alt. 10.5, diam. 5.5 mm.

*Hab.* Andaman Islands.

The shoulder formed by the infra-sutural ridge presents a somewhat striking appearance and recalls some of the Western Pacific Island forms in which this character occurs; the other characters, however, when taken collectively or singly, easily separate it from any of the species described from those regions.

## 27. *Tiara (Radina) multistriata* (Preston).

*Tiara (Radina) multistriata* (Preston), Rec. Ind. Mus. ii, p. 196, pl. 15, fig. 24.

Shell decollate, subulate, dark olive-brown; remaining whorls 4, rather flat, sculptured throughout with fine transverse striæ and coarser spiral striæ; sutures deep and incised; columella arched; peristome acute; aperture ovate; interior bluish grey.

Alt. 26, diam. maj. 10 mm.

Aperture, alt. 9.5, diam. 4 mm.

*Hab.* Andaman Islands.

## Subgenus **STRIATELLA.**

*Striatella*, Brot, Conch.-Cab. 1875, pp. 7, 193.

**TYPES**, *Melania corporosa*, Gould, Tahiti; and *Melania tuberculata*, Muller, N. Africa, S. & E. Asia, Malaysia, N. Australia.

**Range.** Add to the above S. & E. Africa and Tropical Islands of the Indian and Pacific Oceans.

**Original description**:—Testa turrata, mediocris, longitudinaliter plus minusve striata, sæpe transverse plicata; apertura basi rotundata, columella modice torta.

Testa longitudinaliter inciso-striata, sutura canaliculata.

(Typ. *M. corporosa*.)

Testa longitudinaliter elevato-lirata; rubropunctata vel flammulata.

(Typ. *M. tuberculata*.)

## 28. *Tiara (Striatella) tuberculata* (Müller).

*Nerita tuberculata*, Muller, Hist. Verm. 1774 (as *Nerita*), Coromandel; H. & T., C. I. pl. 74, figs. 1-4; Nevill, Hand List, pt. 2, p. 239.

Shell elongate, very acuminate or subulate, pale, thin, sculptured with raised spiral striæ and undulating grooves, blotched with blood-red, these red markings often forming zigzag bands. Whorls 8 or 9, ornamented with longitudinal tubercular ridges, each bearing

about 9 tubercles on the body-whorl; aperture ovate, outer lip acute, polished within and marked with more or less transparent bands.

*Hab.* Throughout India, Burma, and Ceylon, and perhaps one of the most widely distributed and variable of species extending as it does from Morocco in the West to China and Australia in the East.

The principal Indian varieties would seem, according to Nevill, to be as follows:—

*Var. subcrebra*, Nevill, Hand List, p. 241.

“A . . . . . subgranulose variety approaching *M. crebra*, Lea; of a uniform straw-colour; spire not much produced; last whorl convex, whorls 6-7.”

Alt. 22, diam. 7.75 mm.

*Hab.* Bandarawella, Ceylon.

*Var. layardi* (Dohrn), Nevill, Hand List, p. 242.

*Melania layardi*, Dohrn, P. Z. S. 1858, p. 135; Reeve, Conch. Icon. pl. 15, sp. 104; H. & T., C. I. pl. 73, figs. 8, 9.

*Original description*:—Testa turrata, solidiuscula, olivacea; anfr. 6-7 convexi, striis spiralibus, rugis longitudinalibus regulariter ornata, ad suturam fusco-maculata: apertura ovato-oblonga, intus cæruleo-albida; columella rotundata, peristomium valde productum, arcuatum.

Alt. 35, diam. 10 mm.

Aperture: alt. 10, diam. 5 mm.

*Hab.* Ceylon; S. Canara (*Beddome*).

On the S. Canara specimen Nevill makes the following remarks:—

“The first specimens, I believe, of this very characteristic variety described from Continental India. They are a very fine form.—long. 33, diam.  $10\frac{3}{4}$  mm.—7 whorls.”

The dimensions given in the original description are those of Dohrn's largest specimen, he gives them, together with the following description, of a smaller form, thus:—

“*Var. Minor*, decollata, nigrescens, intus cærulea.”

Alt. 22, diam. 7 mm.

Aperture: alt. 7, diam. 4 mm.

*Var. tigrina* (Hutton), Nevill, Hand List, pt. 2, p. 242.

*Melania tigrina*, Hutton, J. A. S. B. 1850, p. 658; H. & T., C. I. pl. 110, fig. 2.

*Original description*:—Shell devoid of apex, the spire being invariably much eroded; general appearance that of *M. pyramis*,

but differs in being coarser, in wanting the strong and prominent longitudinal furrows which characterise that species, and which are observable throughout its length; the outer lip also has a tendency to be more produced; while the flame-shaped streaks of colouring are narrower, closer, and less devious or zigzag, often becoming bifid or pronged on the body-whorl; epidermis pale olive-green or olive-brown, ornamented with close, narrow, irregular transverse dashes. General number of whorls in eroded and decollated specimens five, though nine or ten would appear to be the correct number, wrinkled transversely by coarse lines of increase; the upper angle of the aperture is never so acute as in *M. pyramis*, and the sutures are deeper and whorls more tumid at their junction.

Var. *orissaënsis*, *Nevill*, tom. cit. p. 243.

"A remarkable form; spire short, with ventricose whorls, substance thick, coloration uniform green (or almost so), longitudinal ribbing remarkably developed, even on the last whorl."

Long. 25, diam. 9 (scarcely) mm.

*Hab.* Cuttack, Orissa (*J. Caldwell*).

Var. *luteomarginata*, *Nevill*, tom. cit. p. 244.

Long. 37.5, diam. 13 mm.

*Hab.* Kalgan, Persia; Baluchistan.

Var. *myadougensis*, *Nevill*, tom. cit. p. 245.

"A very distinct form remarkable for its 'terebra-like' produced spire, its contracted or appressed whorls (especially the last); the spiral, undulating sculpture is more acutely prominent than in any form I know; all the whorls, except the last, have a light longitudinal ribbing as well; of a light yellowish-green colour, prettily marbled with brown. Anfr. 8; long.  $27\frac{1}{2}$ , diam.  $7\frac{9}{10}$  mm."

"..... Pl. 74, fig. 1 of the Con. Indica resembles it, only the last whorl is too ventricose, etc."

*Hab.* Myadoug, Upper Burma (*Anderson*).

Subvar. *subplicifera*, *Nevill*, tom. cit. p. 245.

"A form nearer Reeve's fig. 109 B; distinguished from the preceding by the more developed longitudinal structure throughout."

*Hab.* Myadoug (*Anderson*).

## 29. *Tiara (Striatella) sublutosa (Nevill)*.

*Tiara (Striatella) sublutosa* (*Nevill*), Hand List, pt. 2, p. 234.

*Original description* :—"Very strongly decollate, an exact

'miniature' of *M. Brot's* pl. 24, fig. 15, '*M. lutosa*, Gould,' from Upolu. . . . ."

Alt. 15, diam. 6.10 mm.; whorls 3.

*Hab.* Great Nicobar (*Roepstorff*).

### 30. *Tiara* (*Striatella*) *turriculus* (*Lea*).

*Tiara* (*Striatella*) *turriculus* (*Lea*), P. Z. S. 1850, p. 190.

*Melania perpinguis*, Reeve [not of Hinds], sp. 113; Nevill, Hand List, pt. 2, p. 234.

*Original description*:—Testa striata, conoidea, subtenui, obscure maculata, cornea, spira subelevata; suturis impressis; anfractibus novem, convexiusculis, lineis subraris impressis, superne angulatis; apertura parva, subconstricta, intus albida et obscure maculata, ad basim rotunda; columella regulariter curvata.

Alt. 27.75, diam. 10 mm.

*Hab.* Philippines; Andamans (*Roepstorff*).

### 31. *Tiara* (*Striatella*) *nevilli* (*Brot*).

*Tiara* (*Striatella*) *nevilli* (*Brot*), Conch.-Cab. ii, 1877, p. 200, pl. 22, fig. 13; Nevill, Hand List, pt. 2, p. 236.

*Original description*:—Testa subulato-turrita, subcylindracea, solida, virenti-olivacea, nitidula. Spira erosa; anfr. persist. 6-7, declivi-convexiusculi, sutura appressa, subcanaliculato-incisa divisi, supremi longitudinaliter arcte inciso-striati, ultimi 3-4 omnino lævigati vel lineis incrementi leviter striatuli. Apertura piriformis, basi latiuscula, vix effusa; columella subincrassata, parum torta et arcuata; margine dextro subrecte descendente, haud protracto.

Alt. 38, diam. 11 mm.

Aperture: alt. 11, diam. 5.5 mm.

*Hab.* Andaman Islands (*Hanley*); Tahiti (*Morelet*).

Var. *andamanica*, *Nevill*, tom. cit.

" . . . . . distinguished by the upper three or four whorls being invariably longitudinally ribbed, the ribs being not at all prominent and slightly but distinctly arcuate; quite young specimens show the ribbing throughout, the ribs only becoming obsolete on the lower portion of the last whorl. Generally but slightly decollate, eight whorls remaining; covered with a rust-brown coating, beneath which the shell is light green, irregularly and very slightly spotted with brown below the suture; throughout spirally striated; a single specimen only has this spiral sculpture obsolete on the central portion of the last two to three whorls. The majority of specimens are smaller than type-figure of *M. nevilli*, and have the last two whorls increasing much more rapidly in breadth . . . . . "

Subvar. *semilævigata*, *Nevill*, tom. cit.

The author gives no further description than that implied by the name.

*Hab.* Andamans (*Ford*).

Subvar. *appressa*, *Nevill*, tom. cit. p. 237

The last two whorls are contracted much as in typical *T. (S.) nevilli*.

*Hab.* Andamans (*Anderson*).

### 32. *Tiara (Striatella) nicobarica* (*Reeve*).

*Tiara (Striatella) nicobarica* (*Reeve*), *Con. Icon. sp.* 54; *Nevill*, *Hand List*, pt. 2, p. 237.

*Original description*:—Shell turriculated, rather solid, black; whorls ten to twelve, somewhat rounded, the first spirally grooved throughout, the rest with the upper and lower grooves fading away; aperture rather small.

Alt. 33·5, diam. 10 mm. (fig. in *Con. Icon.*).

*Hab.* Nicobar Islands.

Subvar. *canaliculata*, *Nevill*, tom. cit.

Apparently channelled below the suture.

*Hab.* Nicobars (*Roepstorff*); S. Andaman (*Roepstorff*).

Subvar. *gigantea*, *Nevill*, tom. cit.

A large form which, though only having four whorls remaining, is of the following dimensions:—

Alt. 43, diam. 17 mm.

*Hab.* Camorta (*Roepstorff*); S. Andaman (*Roepstorff*).

Var. *fusiformis*, *Nevill*, tom. cit.

“Well distinguished by its produced and fusiform shape; the whorls increase regularly and are more convex than those of the type form, in which the upper whorls are abruptly and contractedly attenuate, the lower ones increasing rapidly in size, especially the last, which is always very tumid. In var. *fusiformis*, on the contrary, it is only a trifle more swollen than the preceding one. More solid and of brighter coloration; sculpture rather less distinct.” (*Nevill*.)

Alt. 32·5 (9 whorls), diam. 9 mm.

*Hab.* S. Andaman (*Roepstorff*).

Var. *perstriatula*, *Nevill*, tom. cit. p. 238.

“The last two whorls are throughout regularly and evenly, finely spirally striated.”

*Hab.* Andamans [?] (*Stoliczka*).

33. *Tiara (Striatella) crebra (Lea)*.

*Tiara (Striatella) crebra* (Lea), P. Z. S. 1850, p. 193 (as *M. crebra*); Reeve, Con. Icon. 1860, sp. 162; var. from Nicobars, Brot, pl. 33, fig. 2, as of Sect. *Tarebia*; Nevill, Hand List, pt. 2, p. 238.

*Original description*.—Testa cancellata, elevato-conica, crassa, tenebroso-castanea; spira valde elevata; anfractibus decem, convexiusculis, ad basim striis impressis; apertura parvula, ovata, intus albida; ad basim rotunda; columella incurvata.

Alt. 37·5, diam. 12·5 mm.

*Hab.* Philippines (*Lea*); Preparis Isd., Bay of Bengal (*Stoliczka, Wood-Mason*); S. Audaman (*Roepstorff*); Nancowri and Katchall, Nicobars (*Roepstorff*).

Subvar. *emaciata*, *Nevill*, tom. cit. p. 239.

“Besides the more contracted whorls the coloration is darker and the longitudinal sculpture less developed.”

Alt. 28·5, diam. 7 mm.

*Hab.* Katchall and Nancowri, Nicobar Islands (*Roepstorff*).

34. *Tiara (Striatella) rivularis (Philippi)*.

*Tiara (Striatella) rivularis* (Philippi), Abbild. ii, pl. 4, fig. 6, 1847, p. 171; Nevill, Hand List, pt. 2, p. 247.

*Original description*.—Testa turrita, virescente, apice decollata; anfractibus 7, convexis, sutura profunda divisio, transverse striatis, superioribus lineis rufis longitudinalibus, medianis serie transversa punctorum infra suturam, pictis; apertura ovato-oblonga, superne acuta, basi effusa; labro basi valde producto.

Alt. 20, diam. 6·75 mm.

*Hab.* Java; Andamans (*Roepstorff*).

Var. *subunifascialis*, *Nevill*, tom. cit.

“... the spiral striation is more or less obsolete on the upper portion of the whorls, imparting a very characteristic appearance to the shell; basal band round the columella not visible within the aperture.”

Alt. 19 (whorls  $8\frac{1}{2}$ ), diam. 6 mm.

*Hab.* Andamans (*Roepstorff*).

35. *Tiara (Striatella) pyramis (Benson)*.

*Tiara (Striatella) pyramis* (Benson), as Species B, Gleanings in Science, no. 13, 1830, p. 22; Hutton, J. A. S. B. xviii, 1850, pt. 2, p. 658; H. & T., C. I. pl. 110, figs. 3, 4.

*Original description*.—Shell subulate-turreted, translucent; whorls depressed, with longitudinal and transverse rugæ, which give a decussated appearance to the upper whorls. Colour pallid,

with bands of red-brown dots or irregular longitudinal streaks of the same colour, sometimes altogether devoid of markings.

"This shell occurs alive in the Gumti, Yamuna, Betwa, and Cén rivers. I have met with the exuviae in the Ganges. In this . . . species the foot is of a pallid colour with brownish black markings. The body is light verdigris-green."

Alt. 29·75, diam. maj. 8·75 mm.

Aperture : alt. 8·5, diam. 4 mm.

The above dimensions are taken from a specimen in the British Museum, none being given in the original description.

### Subgenus **MELANOIDES.**

*Melanoides*, H. & A. Adams, Gen. Rec. Moll. 1854, i, p. 296 ; Nevill, Hand List, pt. 2, p. 248.

TYPE, *Melania asperata*, Lamarck ; Philippines.

Range. S. and E. Asia ; Japan ; Malaysia.

Shell subulate, solid ; whorls often nodulous or rugose ; aperture subcircular, produced in front ; inner lip somewhat callous ; outer lip sinuated, thickened, dilated and produced anteriorly. Operculum subcircular, subspiral, of few rapidly-enlarging whorls.

#### 36. *Tiara* (*Melanoides*) *herculea* (Gould).

*Tiara* (*Melanoides*) *herculea* (Gould), Proc. Boston Soc. Nat. Hist. 1846, ii, p. 100 ; Otia Conch. p. 199 ; H. & T., C. I. pl. 72, fig. 5.

*Original description* :—Testa ponderosa, elongato-conica, fusco-viridis, decollata : anfr., numero integro ad 15, superstitibus 2–5, planulatis, infra suturam constrictis, plicis profundis 4-nodosis longitudinalibus ; ultimo subcarinato, basi striis crassis cincto ; apertura subrhomboidali ; antice producta, callo columellari rotundato, crasso, fauce plus minusve fusco.

Alt. 71·5, diam. 25·5 mm.

*Hab.* Tavoy River.

#### 37. *Tiara* (*Melanoides*) *gloriosa* (Anthony).

*Tiara* (*Melanoides*) *gloriosa* (Anthony), Amer. Journ. Conch. i, 1865, pt. 3, p. 207, pl. 18, fig. 2 ; H. & T., C. I. pl. 72, figs. 1, 2.

*Original description* :—Shell ovate-conic, smooth, olivaceous ; spire elevated, but abruptly decollate, exhibiting only four whorls, which are convex and quite broad ; sutures very deep and distinct ; lines of growth remarkably prominent, often amounting to varices, and with revolving striæ less prominent, but, nevertheless, distinct, decussating with them ; aperture large, ovate, blotched with reddish-brown within ; columella very much curved, thickened



with a white callus, and forming, with the sinuous outer lip, a lengthened, but not very decided sinus at the base.

Alt. (as eroded) 63, diam. 25 mm.

Aperture: alt. 25, diam. 18 mm.

*Hab.* Pegu.

Belongs to a group of which *M. herculea*, Gould, may be cited as an example, but is much larger, has never such regular folds as that species, nor are its concentric striæ so prominent as to form nodulous ridges as in *M. herculea*; it is probably one of the most ponderous species of the genus; the revolving striæ are more prominent near the sutures, and at the base of the shell they are also much crowded and more elevated.

Var. *peguensis*, *Hanley & Theobald*, H. & T., C. I. pl. 72, fig. 6 (as *M. peguensis*); *Nevill*, Hand List, pt. 2, p. 250 (as var. of *M. touranensis*, *Soul.*).

Differing chiefly from the typical form in the absence of spiral striation and basal contraction of the aperture.

Alt. 88, diam. 31 mm. (fig. in *Conch. Ind.*).

*Hab.* Henzada, Pegu (*Stoliczka*).

Var. *compacta*, *Nevill*, tom. cit. (as var. of *M. touranensis*, *Soul.*).

Smaller and more compact than the above, with the spiral striæ at the base of the last whorl very distinct but more crowded than in typical *M. gloriosa*.

Alt. 63·5, diam. 23·5 mm.

*Hab.* Henzada (*Stoliczka*).

Var. *beddomeana*, *Nevill*, tom. cit. p. 251 (as var. of *M. touranensis*, *Soul.*).

"Closely resembles the preceding in shape of the whorls and spiral striation at base of the last whorl; relatively even more solid; appears to be perfectly smooth throughout, with the exception of the above-mentioned basal striation." (*Nevill.*)

Alt. 44, diam.  $17\frac{2}{3}$  diam.

*Hab.* Near Moulmein (*Beddome*).

### 38. *Tiara* (*Melanoides*) *humerosa* (*Gould*).

*Tiara* (*Melanoides*) *humerosa* (*Gould*), Proc. Boston Soc. Nat. Hist. ii, 1847, p. 219; *Otia* *Conch.* p. 200; *Brot*, *Conch.-Cab.* 1875, p. 107.

*Melania* (*Melanoides*) *reevei*, *Brot*, *Matér.* i, 1862, p. 46 = *balteata*, *Reeve*, sp. 144, *fidè* *Nevill*.

*Original description*:—Testa elongato-turrita simplex, viridicornea; spira derosa, anfr. ad 8 convexis, prope suturam obsolete angulatis, lineis tenuissimis spiraliter striatis, ultimo antice

costato-striato; apertura subovali, antice vix. effusa; columella rotundata, alba, fauce fasciatim sublivida.

Alt. 47.5, diam. 12.5 mm.

Hab. Manko, Tavoy.

Var. *lanceolata* (Hanley & Theobald), Conch. Ind. pl. 153, fig. 1; Nevill, Hand List, pt. 2, p. 248.

A slender form.

Alt. 63, diam. 22.75 mm.

Hab. Mandalay (Anderson); Henzada, Pegu (Stoliczka); Thyet Myo (Hungerford).

Var. *imbricata* (Hanley & Theobald), tom. cit. fig. 4; Nevill, Hand List, pt. 2, p. 249.

"In quite young specimens the 'imbricated' sculpture can scarcely be detected." (Nevill.)

Alt. 65, diam. 25 mm.

Hab. Henzada (Stoliczka); Yaylaymaw (Anderson).

Var. *solidiuscula*, Nevill, Hand List, pt. 2, p. 249; Brot, Conch.-Cab. ii, pl. 13, fig. 6 (as "*M. reevei* [juv.]").

"... Solid and light yellow coloured; a quite young specimen having a single broad brown belt on the middle of the last whorl." (Nevill.)

Alt. 48, diam. 18 mm.

Hab. Pegu (Stoliczka).

### 39. *Tiara* (*Melanoides*) *variabilis* (Benson).

*Tiara* (*Melanoides*) *variabilis* (Benson), J. A. S. B. v, 1836, pp. 746-747; Brot, in Conch.-Cab. 1875, pp. 85-87, pl. 10, figs. 1, 1 a-d; H. & T., C. I. pl. 109, figs. 2, 3, 5, 6.

*Original description* :—Testa elongato-turrita, solida, olivacea vel picea, sub epidermide albida; anfractibus convexis transverse liris, longitudinaliter striatis et costatis; costulis anfractus ultimi superne nodulosi; apice plerumque truncato; suturis excavatis. Apertura intus violacea, columellæ basi sinuata.

Hab. Goomty River at Jonpur, Tolly's Nullah, near Calcutta.

Var. A. Anfractuum inferiorum liris elevatis, nodulis elevatoribus.

Hab. River Hooghli at Calcutta.

Var. B. Liris, mediana excepta, obsoletis; nodulis subspinosi carinam humeralem coronantibus.

This is the var. *spinosa*, Benson.

Var. C. Lævis liris costulisque obsoletis; anfractus ultimi medio subcarinato, adulti nodulis humeralibus frugaliter sparsis.

Var. D. *Anfractuum superiorum costulis obsoletis, ultimi et penultimi liris transversis costulis longitudinalibusque superne serie duplici nodulosis.*

Benson further adds :—"Varieties B, C, and D are in the Silhet collection. The type specimens of several of these varieties would, if viewed apart, be easily mistaken for distinct species, but they melt into each other so gradually, occasionally showing the characters of more than one variety combined in the same shell, that no doubt remains of their blending in one species. In Tolly's Nullah I took larger specimens than any in the collection [Museum of the Asiatic Society]; though at least four twists of the spire were defective, one individual measured 3·4 inches in length. The Gúmtí specimens are less liable to truncation, and in young specimens the apices are nearly perfect. I have not observed more than 12 whorls present in any specimen. I described the type of the species without a name as species A in the 13th no. of the 'Gleanings in Science.' It was figured as no. 7 in plate vii. vol. i."

Subvar. *cincta* (*Hanley & Theobald*), H. & T., C. I. pl. 109, fig. 5; Nevill, Hand List, pt. 2, p. 252.

The ribs in this variety show a strong tendency to become spinose.

Alt. 58, diam. 19 mm. (fig. in *Conch. Ind.*).

*Hab.* Assam (*Bacon*); Raniganj (*Stoliczka*).

Subvar. *subtuberculata*, *Nevill*, tom. cit.

"Aperture relatively very small, almost round; last two whorls with scarcely any sculpture." (*Nevill*.)

Alt. 36, diam. 12·5 mm.

*Hab.* Calcutta (*Stoliczka*).

Subvar. *subspinosa*, *Nevill*, tom. cit. p. 253.

No other description given than that implied by the name.

*Hab.* Tank opposite Bengal Club, Calcutta (*Nevill*).

Var. *subvaricosa*, *Nevill*, tom. cit.

Appears to be more or less varicose.

Alt. 65·5, diam. 24 mm.

*Hab.* Arakan and Pegu? (*Stoliczka*).

Var. *fasciata*, *Nevill*, tom. cit. p. 256.

Having "a somewhat indistinct brown band in the middle of the whorls, two at base; substance rather thin, outer lip not acutely angled at base, although angled at the periphery; no tendency to possess a raised keel there, as is often the case."

Alt. 33, diam. 17 mm. (4 remaining whorls).

*Hab.* Bhootan (*Stoliczka*).

40. *Tiara (Melanoides) episcopalis* (I. & H. Lea).

*Tiara (Melanoides) episcopalis* (I. & H. Lea), P. Z. S. 1850, p. 184, in part; Reeve, Con. Icon., *Melania*, pl. 3, sp. 12; H. & T., C. I. pl. 72, fig. 7, & pl. 75, figs. 5, 7.

*Original description*:—Testa plicata, turrita, subcrassa, tenebrosa-castanea; spira elevata; suturis impressis; anfractibus subconvexis, prope suturam superiorem concavis; plicis raris, subacuminatis; apertura magna, elliptica, intus cærulescente; columella contorta.

Alt. 61, diam. 20 mm.

*Hab.* A sluggish river, Malacca.

The authors also append the following note:—

“This is a remarkable and interesting species, and differs from any which has been described in having rather large and somewhat distant folds rising on the upper part into nodular points in all the four specimens submitted for examination. The apex of these specimens being truncated, the number of whorls cannot be ascertained. A perfect adult would probably present about ten. The folds are distinct on the four lower whorls only. On the middle of the lower whorl there is a slightly elevated line, below which are about six obscure striæ. The aperture is large, and more than one-third the length of the shell; it is twisted, and has an elongated base. The columella is whitish and very much incurved. The operculum is more spiral than usual, and the polar point more toward the centre.”

A number of minor varieties are cited by Nevill in his ‘Hand List,’ from which, however, for the purposes of the present work it will be sufficient to quote the following:—

Var. *pontificalis* (v. d. Busch), Mousson, L. & S. Moll. Java, p. 65, pl. 10, fig. 3 (as *Melania pontificalis*).

*Melania infracostata*, v. d. Busch, in Reeve, Conch. Icon., *Melania*, sp. 14; Nevill, Hand List, pt. 2, p. 259.

*Original description*:—Testa turrita, magna, crassa, lactea, superne flammulis nonnullis picta, epidermide olivacea induta, anfractibus longitudine transversimque tenuiter striatis, superioribus fere planatis, inferioribus convexis, ultimo et penultimo crassicostatis, costis distantibus superne in nodulos exeuntibus; columella arcuata, labro acuto ad basin producto; apertura ovata, lactea.

Alt. 72, diam. 24.5 mm.

*Hab.* Borneo; near Sibisagar (Peal).

41. *Tiara (Melanoides) menkeana* (Lea), emend.

*Melania menkiana*, in Lea, Obs. *Unio*, iv, p. 24, for *Melania plicata*, Lea, Trans. Amer. Phil. Soc. (& Obs. *Unio*, ii, p. 20), pl. 23, fig. 95 (not of Menke, Synops. 1830).

*Melania menkeana*, Lea, Brot in Conch.-Cab. 1875, p. 91, pl. 11, figs. 1, 1 a, b, H. & T., C. I. p. 45, pl. 110, fig. 6.

Testa turrita vel conoideo-turrita, solidula, fusco-olivacea nonnunquam brunneo bi- vel trifasciata; spira decollata, anfr. superstit. ad 8, convexi, *in medio angulati*, infra angulum transversim plicati, plicis ad angulum in spinas breves, *extus directas* terminatis. Anfr. ultimus basi obsolete liratus, *linea suturali conspicue filoso-angulata*. Apert. elliptico-ovata, superne acuta et angustata, basi angulatim producta; columella contorta, margine dextro simplici, basin versus protracto. (Brot, in Conch.-Cab.)

Alt. 46, diam. 20 mm.

Aperture: alt. 18.5, diam. 9 mm.

Hab. Bengal.

Var. *microstoma*, Nevill, Hand List, pt. 2, p. 261.

A small form with a small and almost rounded aperture.

Alt. 25, diam. 11.75 mm.

Hab. Sylhet.

#### 42. *Tiara* (*Melanoides*) *baccata* (Gould).

*Tiara* (*Melanoides*) *baccata* (Gould), Proc. Bost. Soc. Nat. Hist. ii, p. 219; Otia Conch. p. 200; H. & T., C. I. pl. 75, figs. 1, 4; Nevill, Hand List, pt. 2, p. 262.

*Original description*:—Testa magna, crassa, elongato-turrita, epidermide fusco-castaneo induta; spira decollata, anfr. 6 rotundatis, plicis longitudinalibus et costis volventibus triseriatim nodoso-decussatis, ultimo ad basim 4 costato; apertura lunata, labio antice producto, columella aurantia valde arcuata; fauce cærulescente fusco-fasciato.

Alt. 51, diam. 18.5 mm.

Hab. Thoun-gyin River, Burma.

Subvar. *recta*, Nevill, Hand List, pt. 2, p. 262; Brot, in Conch.-Cab. 1874, pl. 9, fig. 6 (as *M. baccata*, Gld.).

“Well represented by the above figure, but more decollate, only  $2\frac{1}{2}$  whorls remaining.” (Nevill.) Upper Salwin.

The following varieties are depicted by Hanley and Theobald in the Conch. Indica, pl. 75, figs. 2, 3, both from the Shan States:—

Var. *fusiformis*.

Var. *pyramidalis*.

*Melanoides variabilis*, var. *pyramidalis*, Theobald, J. A. S. B. xxxiv, 1865, pt. 2, pl. 19, fig. 7.

Var. *iravadica* (*Blanford*), P. Z. S. 1869, p. 445; H. & T., C. I. pl. 71, fig. 1; Nevill, Hand List, pt. 2, p. 262.

*Original description*:—Testa elongato-turrita, tenuis, fusco-olivacea, decollata. Anfr. circa 7, primi erosi, 3-4 superstites convexi, superi seriebus duabus spiralibus nodorum confertorum circumdati, ultimus spiraliter liratus, nodis fere vel omnino obsoletis. Apertura rhomboideo-ovata, antice subeffusa; peristoma tenue, margine externo subrecto, basali antice porrecto, columellari sinuato. Operc.?

Length (of a large decollated specimen) 25, diam. 15 mm.

Aperture taken obliquely: length 13, diam. 8 mm.

Total length (of a medium-sized example, also decollated) 13, of the last whorl 11, largest diameter 14, smallest 12.5 mm.

Aperture taken obliquely and including the labrum: length 13, diam. 8.5 mm.

*Hab.* Irawady River above Malé and Bhamo; Manwyne and Yaylaymaw.

#### 43. *Tiara* (*Melanoides*) *terebra* (*Benson*).

*Tiara* (*Melanoides*) *terebra* (Benson), J. A. S. B. v, 1836, p. 747; Reeve, Conch. Icon. pl. 11, sp. 59.

*Melanoides torquata*, Busch, in Philippi, Ab. N. Conch. i, *Melania*, pl. 1, fig. 18; Nevill, Hand List, pt. 2, p. 264.

*Original description*:—Testa elongato-turrita, olivaceo-brunnea, lævi, polita; anfractibus tumidis; suturis excavatis; sinu inter basin labri columellamque nullo. . . . Testa truncata.

Alt. 41 mm.

*Hab.* North-East Frontier of Bengal; Sylhet.

Benson remarks: "It is distinguished from the young of the smooth variety of *M. variabilis* by the want of angularity at the centre of the lower whorl, by its polished epidermis, more tumid whorls and more deeply sunk sutures, as well as by the absence of the sinuation of the inner lip which characterizes that species. The apex of the shell is more or less truncated."

#### 44. *Tiara* (*Melanoides*) *spinata* (*Godwin-Austen*).

*Tiara* (*Melanoides*) *spinata* (Godwin-Austen), P. Z. S. 1872, p. 514, pl. 30, fig. 1 (as *Melanoides*); Brot, in Conch.-Cab. 1875, p. 89, pl. 10, figs. 2, 2 a; H. & T., C. I. pl. 109, fig. 1.

*Original description*:—Shell angularly turreted; colour olive-green; spire acute, rather rapidly decreasing in diameter; apex eroded; suture marked by a distinct cord continuous with that on the lower angle of the last whorl; whorls 5-6 (there would be 8 if perfect), very convex and flattened on the periphery, with strong tubercles arranged in two parallel longitudinal rows, the spines being rather longer on the upper; aperture ovate, vertical,

well channelled at the base, a thin milky callus on the columellar margin, within pale grey with two or more bands of brown coinciding with the rows of spines and the corded surface of the outer base.

Operculum paucispiral, nucleus subcentral.

Animal 1.4 in. long; foot round and large, not angular in front; colour grey, mottled with ochre; body also grey, the ochre markings showing as streaks; tentacles very short, 0.4 inch.

Alt. 58, diam. 30 mm.

Aperture: alt. 26, diam. 17 mm.

*Hab.* Kopili River, North Cachar Hills, a tributary of the Bráhmáputra.

#### 45. *Tiara* (*Melanoides*) *baccifera*, *Theobald*.

*Tiara* (*Melanoides*) *baccifera* (Theobald), J. A. S. B. xxxiv, 1866, pt. 2, p. 274, pl. 9, fig. 5 (as *M. variabilis*, var. *baccifera*).

*Melanoides subasperata*, Nevill, Hand List, pt. 2, p. 262.

Differing from *M. variabilis* in having the "whorls ornamented with four or five rows of beaded keels, the transverse ribbing being often well marked likewise" (*Theobald*). The small and circular aperture is also a distinctive character.

Alt. 47.5, diam. 18.75 mm.

*Hab.* Shan States.

Var. *sublævigata*, *Nevill*, Hand List, pt. 2, p. 262.

A rather smoother form.

*Hab.* "Burma" (*Stoliczka*); Shan States (*Fedden*).

Var. *vittata* (*Theobald*), J. A. S. B. xxxiv, 1866, pl. 9, fig. 4, p. 273 (as *M. variabilis*, var. *vittata*); *Nevill*, Hand List, pt. 2, p. 263.

Shell smooth, with somewhat convex whorls, rather pale in colour, ornamented with a dark median band which becomes obsolete on the last whorls; it is, however, well marked on the earlier convolutions.

Alt. 50, diam. 18.30 mm.

*Hab.* Shan States (*Fedden*).

#### 46. *Tiara* (*Melanoides*) *jugicostis* (*Benson*).

*Tiara* (*Melanoides*) *jugicostis* (Benson), MS. (Hanley & Theobald), Conch. Ind. 1876, pl. 110, figs. 8, 9; *Nevill*, J. A. S. B. xlv, 1877, pt. 2, p. 33.

"Shell small, slightly decollated; whorls five, abruptly angular, smooth and shining, with a few rather distant, somewhat obsolete and irregular, transverse ridges on the lower half of the last whorl; longitudinally angularly ribbed, ribs very distant, thick

prominent, almost varicose, eight of them on the last whorl, disappearing towards the base; very pale green, with no markings except a subobsolete brown band at base." (Nevill.)



Fig. 1.—*Tiara (Melanoides) jugicostis*, Bens. (type).  $\times 2$ .

Alt. 12, diam. 6 mm.

*Hab.* Tenasserim River (Conch. Ind.); Myadoun, Burma (Nevill).

#### 47. *Tiara (Melanoides) godwini* (Brot).

*Melanoides hanleyi*, Godwin-Austen, P. Z. S. 1872, p. 514, pl. 30, fig. 2 (as *Melanoides*); H. & T., C. I. pl. 110, fig. 5.

*Tiara (Melanoides) godwini* (Brot), in Conch.-Cab. 1875, p. 90, pl. 10, fig. 3.

*Original description*:—Shell turreted, colour rich dark chestnut-brown; spire rather acuminate, rapidly decreasing; apex eroded; suture impressed but slightly, but strongly marked; whorls 5 (without the apical), flat, sharply angular above with a single row of well-defined small tubercles on the angular margin; body-whorl large, well rounded below, distinctly corded at base near the columellar margin; aperture vertical, ovate, very slightly effused at base; within pale grey, with three or more red-brown bands.

Alt. 47, diam. 25 mm.

Aperture: alt. 22, diam. 12 mm.

*Hab.* Diyūng River, North Cachar Hills.

#### Subgenus **PACHYCHILUS**.

*Pachychilus*, Lea, P. Z. S. 1850, p. 179.

TYPE, *P. cumingii*, Lea [as gen. n.]; Central America.

Range. W. Indies; C. & S. America; Tropical Asia.

*Original description*:—Testa conica. Apertura ovata, basi integro. Labrum crassum. Collumella superne incrassata. Operculum suborbiculare, corneum.

#### 48. *Tiara (Pachychilus) limborgi* (Hanley).

*Tiara (Pachychilus) limborgi* (Hanley), Journ. Linn. Soc., Zool. xiv, 1878, p. 580; Nevill, Hand List, pt. 2, p. 269.



*Original description*.—Testa oblongo-turrita, brevis, magis minusve crassa, olivaceo-flava. Anfractus pauci (circiter 8), magni, convexi, rapide crescentes; supremi læves, fascia spirali livida aliquantulum supra medium sæpius picti; inferiores costellis subdepressis (nonnunquam versus costellas basis acutiores angustas magisque distantes obsolete) spiraliter ornati. Sutura distincta.



Fig. 2.—*Tiara (Pachychilus) limborgi*, Hanley (type).

Apertura ovato-elliptica, basi rotundata, circiter  $\frac{3}{4}$  longitudinis testæ æquans, livida vel livido-fasciata; peristomo pallida; columella arcuata, macula livida picta, haud angusta.

Alt. 25 mm.

*Hab.* Mulé-it Range, Tenasserim (*Limborg*).

“The shell, . . . . . displays no other painting than the narrow livid band which winds occasionally to the outer lip; it is probable, however, that additional ones are sometimes developed upon the body-whorl. The spire tapers quickly to its point. . . . . There are no longitudinal folds.”

#### 49. *Tiara (Pachychilus) hungerfordiana*, Nevill.

*Tiara (Pachychilus) hungerfordiana*, Nevill, Hand List, pt. 2 p. 270.

“Slightly truncate, seven whorls remaining, . . . . . thick and solid, of a yellowish-brown colour, girt with a single well-marked band in the middle of the upper whorls; three bands on the last whorl; the basal margin subacutely angled, not rounded . . . ; no spiral sulcation at base of last whorl.”

Alt. 39.5, diam. 16 mm.

*Hab.* Upper Burma (type) (*Hungerford*); Pegu.

#### Subgenus ACROSTOMA.

*Acrostoma*, Brot, in Conch.-Cab. 1874, p. 17.

TYPE, *Melania hugeli*, Philippi; India.

Range. India; Java.

*Original description*.—Testa fusiformis subbiconica; apertura basi angulatim producta.

50. *Tiara* (*Acrostoma*) *hügeli* (*Philippi*).

*Tiara* (*Acrostoma*) *hügeli* (*Philippi*), Abbild. N. Conch. i, p. 61, *Melania*, pl. 2, fig. 8.

*Melania siphonata*, Reeve, Conch. Icon. pl. 20, sp. 143; H. & T., C. I. pl. 71, figs. 5, 6, Nevill, Hand List, pt. 2, p. 270.

*Original description*:—Testa oblongo-conica, obscure fusca; anfractibus planiusculis, transversim striatis; ultimo ventricosus, basi grosse sulcatus; apertura ovata, anfractus 3 antecedentes simul sumptos æquante, basi manifeste effusa; columella arcuata.

Alt. 33, diam. 19.5 mm.

*Hab.* Khasi Hills; Mysore; Upper Canvery River (*Blanford*).

Var. *compacta*, *Nevill*, Hand List, pt. 2, p. 270.

“Easily distinguished by its short, stout form, relatively contracted aperture, less tumidly swollen, but more subangulate last whorl, and closer spiral sculpture; the spire is more truncate, the coloration darker.”

Alt. 25.5, diam. 13.75 mm.

*Hab.* Wynaad [type var.] and Cochin Hills (*Beddome*); Canvery River (*Jerdon*).

51. *Tiara* (*Acrostoma*) *assamenis*, *Nevill*.

*Tiara* (*Acrostoma*) *assamensis*, *Nevill*, Hand List, pt. 2, p. 271; Hanley, Conch. Misc. pl. 5, fig. 43, as “*M. hugeli*, var. of *Philippi*, from Khasya.”

*Original description*:—Remarkably close to *Mel. hügelii*, from which it can be distinguished by its less solid substance, its much more convexly rounded whorls, the last not being (more or less) subangulate as in its ally; of a plain, uniform, dark colouration; of similar minute striation, but wanting the spiral sulcations at base of last whorl; characters of the columellar margin and aperture generally much as in typical *M. hügelii*, strongly decollate, three whorls only remaining.

Alt. 35, diam. 18.5 mm.

*Hab.* North Cachar (*Godwin-Austen*); “*Delaima*”? (*Nevill*).

52. *Tiara* (? *Acrostoma*) *præmordica* (*Tryon*).

*Tiara* (? *Acrostoma*) *præmordica* (*Tryon*), Amer. J. Conch. ii, pt. 2, 1866, p. 111, pl. 10, fig. 3; Brot, in Conch.-Cab. 1875, p. 108, pl. 13, figs. 8, 8 a; H. & T., C. I. pl. 153, fig. 2.

*Original description*:—Shell ovately conical, robust, covered with regular, close, curved growth lines, and with rounded revolving ribs, of which seven are on the body-whorl; spire conical elevated, (? eroded), suture deeply impressed; whorls convex, surface

formed into a succession of planes by the revolving ribs; aperture ovate, a little broadly effused below; the ribs form slight sulcations within the aperture. Reddish brown, sometimes dark greenish-brown; internally white or light yellowish, the sulcations deep brown.

Alt. (eroded) 30, diam. 22 mm.

Hab. Burma.

### 53. *Tiara* (*Acrostoma*) *pagodula* (Gould).

*Tiara* (*Acrostoma*) *pagodula* (Gould), Proc. Boston Soc. Nat. Hist. 1847, ii, p. 219; Otia Conch. p. 200; Reeve, Conch. Icon., *Io*, fig. 10 (as *Io*), H. & T., C. I. pl. 153, fig. 3.

*Original description*:—Testa crassa sub-rhombea, turrita, tenuiter striata, fusco-castanea, decollata; spira elevata, conica; anfr. 4 angulatis, angulo spinis 6 robustis armato; ultimo antice sub-rostrato, et costulis ad 4 cincto; apertura ovata, antrorsum producta, fauce cærulescente, fusco-maculato.

Alt. 38, diam. 22.5 mm.

Hab. Thoungyin River, a branch of the Salwin.

### Subgenus **MELANELLA**.

*Melanella*, Swainson, 1840, Treat. Malac. p. 341: Nevill, Hand List, pt. 2, p. 271.

TYPE, *Melania holandri*, Férussac; Austria-Hungary.

Range. S.E. Europe; S. & E. Asia; Malaysia.

*Original description*:—Obovate; spire scarcely longer than the aperture, which is entire; inner lip much thickened its whole extent.

### 54. *Tiara* (*Melanella*) *zonata* (Benson).

*Tiara* (*Melanella*) *zonata* (Benson), J. A. S. B. v, 1836, p. 747; Philippi, Abbild. N. Conch. i, *Melania*, pl. 1, fig. 12; Reeve Conch. Icon. pl. 31, sp. 217; H. & T., C. I. pl. 71, fig. 4; Nevill, Hand List, pt. 2, p. 272.

*Original description*:—Testa ovato-conica-lævi, longitudinaliter striata, olivacea, zonis tribus brunneis fasciata, anfractibus leviter convexis, suturis minime profundis; apertura albida, ovato-oblonga, infra subangulata.

Alt. 21.25 mm.

Hab. North-East Frontier of Bengal; Sylhet.

### 55. *Tiara* (*Melanella*) *riqueti* (Grateloup).

*Tiara* (*Melanella*) *riqueti* (Grateloup), Trans. Lin. Bordeaux, xi, pl. 5, fig. 28; H. & T., C. I. pl. 71, fig. 10; Brot, in Conch.-Cab. 1877, p. 333, pl. 34, figs. 6, 6 a.

"Testa *ovato-turrita*, tenuicula, nitida, cornea, sparsim fusco-punctata. Spira modice exserta, integra, acuta; anfr. 8-9; supremi transverse plicati et longitudinaliter striati, *medio angulati et submuricati*, sequentes convexiusculi, infra suturam leviter constricti, transversim sinuose costati, *sparsim longitudinaliter striatuli*, costis ad suturam in nodulis terminatis; anfr. ultimus basi liris elevatis 5-7 ornatus. Apert. ovata, superne acuta, basi valde et subanguste effusa; margine dextro valde sinuoso, et versus basin conspicue arcuatim producto; columella torta, modice arcuata." (*Brot*, in *Conch.-Cab.*)

Alt. 16, diam. 7 mm.

Aperture: alt. 8, diam. 4 mm.

*Hab.* India, Bombay (*Grateloup*), Quilon, Travancore, Cochin (*Hanley*); Philippines (*Cuming*); Java? (*Dunker*).

### Subgenus TAREBIA.

*Tarebia*, H. & A. Adams, 1854, Gen. Rec. Moll. p. 304 (as subgenus of *Vibex*, Oken).

TYPE, *Melania granifera*, Lamarck; Timor.

Range. S. & E. Asia; Malaysia; Pacific Islands.

*Original description*:—Shell ovato-fusiform, whorls granulose or tessellated with nodules: outer lip sinuated towards the hind part; interior of aperture often furnished with spiral grooves.

#### 56. *Tiara* (*Tarebia*) *batana* (*Gould*).

*Tiara* (*Tarebia*) *batana* (*Gould*), Proc. Boston Soc. Nat. Hist i, p. 144; *Otia* *Conch.* p. 191, H. & T., C. I. pl. 74, figs. 8, 9; Nevill, Hand List, p. 274.

*Original description*:—Testa turrita, solida, fusco-virescente, apice erosa; anfract. 6-7, planulatis, postice sub-coronatis, costulis longitudinalibus et volventibus gemmularum series tres efformantibus; apertura angusto-ovata, postice coronata, intus cærulescente, columella alba.

Alt. 25.5, diam. 38 mm.

*Hab.* Tavoy; Tenasserim River.

#### 57. *Tiara* (*Tarebia*) *broti* (*Dohrn*).

*Tiara* (*Tarebia*) *broti* (*Dohrn*), in Reeve's *Con.* Icon. pl. 22, sp. 160.

*Melania chocolatum*, Brot, *Revue Zool.* 1860, June, pl. 16, fig. 2, H. & T., C. I. pl. 71, figs. 2, 3; Nevill, Hand List, p. 276.

Shell ovately turreted, rather solid, burnt-olive; whorls few, decussately wrinkle-edged throughout, concavely angled at the upper part, spinously tuberculed at the angle; aperture rather small, truncated at the base, lip notched at the upper part.

*Hab.* Ceylon.

"Strongly grain-wrinkled throughout, and conspicuously coronated with spine-tubercles." (Reeve.)

Subvar. *subviridis*, Nevill, tom. cit.

"... it may fairly be considered a connecting link between this species and *M. rudis*." (Nevill.)

Alt. 26, diam. 11.25 mm. (decollate,  $3\frac{1}{2}$  whorls only remaining).

Hab. Ceylon (Layard).

### 58. *Tiara* (*Tarebia*) *rudis* (Lea).

*Tiara* (*Tarebia*) *rudis* (Lea), P. Z. S. 1850, p. 186; Reeve, Conch. Icon. pl. 24, sp. 172; H. & T., C. I. pl. 74, figs. 7, 10, as *Melania rudis*; Nevill, Hand List, p. 275.

*Original description*:—Testa plicata, subfusiformi, crassa, cornea; spira subelevata; suturis irregulariter impressis; anfractibus planulatis transversim lineis impressis cinctis, superne canaliculatis; plicis numerosis, crebris; apertura parva, ovata, intus albida; labro superne emarginato; columella lævi, subcrassa, torta.

Alt. 27, diam. 10 mm.

Hab. Ceylon; Tenasserim River.

The original locality is given as Amboyna.

Nevill in his Hand List cites a "var. *ceylonica*," but without figure or description.

### 59. *Tiara* (*Tarebia*) *lineata* (Gray).

*Tiara* (*Tarebia*) *lineata* (Gray), Wood, Index Test. Supp. (1828), *Helix*, fig. 68; Trosch. in Wieg. Arch. Nat. 1837, p. 176.

*Melania lirata*, Benson, J. A. S. B. v, 1836, p. 782, name only for nameless fig. D in Glean. Sci. Calcutta, i (1829); Reeve, Conch. Icon. pl. 24, sp. 170; H. & T., C. I. pl. 71, fig. 7; Nevill, Hand List, p. 276.

*Original description*:—Testa conica, exserta, tenui, subdiaphana, anfractibus applanatis, lineis elevatis spiralibus 7-8, quarum superiores plerumque tuberculatae sunt, cinctis; apertura ovato-acuta. Anfr. 10.

Alt. 22, diam. of the last whorl 9, alt. of aperture 10 mm.

Hab. River Goomty; Tenasserim, etc.

Nevill in his 'Hand List of Mollusca in the Indian Museum' notes the following forms:—

"With one or two undulating, subgranulose keels below the suture only; well represented by the Con. Indica, pl. 71, fig. 7—Calcutta—granulose sculpture distinct and well developed; fairly represented by M. Brot's pl. 33, fig. 6, excellently by Reeve's fig. 170 (Sikkim). Long. 30, diam. 14; another long. 34, diam.  $12\frac{1}{2}$  mil."; Calcutta [in tanks].

"Long. 19, diam. 8 mill., granulose sculpture almost obsolete." Teria Ghat; Ceylon; Tespore; Goalundo; Mandalay; Gowhatty and Bhootan.

Var. *semigranosa* (v. d. Busch), Nevill, Hand List, p. 277.

*Melania semigranosa*, v. d. Busch, Philippi, Abbild. i, 1884, Java.

"Differs conspicuously by the shorter spire, and the more tumidly ventricose last whorl, which is also more produced, etc. Long. 31.

"Diam. 15 mm; apex eroded.

"Hab. Near Moulmein.

"Long. 18, diam.  $8\frac{1}{2}$  mm. May be considered as a connecting link with *M. batana*, Gld.—Pegu.

"A fine form with turriculately planulate whorls. Long. 30, diam. 13 mm.—Meetan, Tenasserim Province; Teria Ghat?" (Nevill.)

Subvar. *pergranosa*, Nevill, tom. cit.

"Long.  $15\frac{1}{2}$ , diam.  $7\frac{1}{4}$  mm. Granulose sculpture very prominent." (Nevill.)

Hab. Port Canning.

Var. *flavida* (Dunker), Nevill, tom. cit. p. 277; Philippi, Abbild. i, 1884, p. 164, pl. 3, fig. 15.

*Original description*:—Testa parva, oblongo-pyramidata, solidula, flavida, diaphana, anfractibus senis planulatis, transversim sulcatis; apertura subelliptica.

Alt. 12, diam. 4.5 mm.

A pale yellowish variety originally described as a species without locality, it is a common Javan form, Indian specimens of which, according to Nevill, have the spire more subcylindrically produced than those from Java.

Hab. Teria Ghat (*Stoliczka*).

### Subgenus **PLOTIA**.

*Plotia*, H. & A. Adams, Gen. Rec. Moll. 1854, p. 295.

TYPE, *Melania spinulosa*, Lamarck = *M. scabra*, Müller; S. Asia.

Range. S. Asia, Malaysia and Tropical Islands of Indian and Pacific Oceans.

*Original description*:—Shell ovate, fusiform; whorls spinose, transversely sulcate; aperture elongate, simple in front.

#### 60. *Tiara* (*Plotia*) *scabra* (Müller).

*Tiara* (*Plotia*) *scabra* (Müller) (as *Buccinum scabra*), Hist. Verm. ii, p. 136; Chemn. Conch.-Cab. figs. 1259, 1260, badly as (*Helix scabra*); Brug. Enc. Méth., Vers, i, p. 330 (as *Bulinus scabra*); Desh. ed. Lam. Anim. s. Vert. ix, p. 443.

*Helix aspera*, Gmel. Syst. Nat. fig. 3656; Dillw. Cat. ii, p. 950; Wood, Ind. Testac. pl. 34, fig. 141.

*Melania elegans*, Reeve, Con. Icon., *Mel.* sp. 178; H. & T., C. I. pl. 73, figs. 1-4; Brot, in Conch.-Cab. 1877, pp. 266-269, pl. 27, figs. 14, 14 a-e, 15, 15 a.

"Shell ovate, sometimes a little elongated, rather thin, brownish-

olive, dotted, and sometimes streaked with purple-rust; whorls seven to nine, specially unequally striately ridged, slopingly angled round the upper part, prickly spined at the angle, spines a little descending in varices; aperture ovate." (*Reeve*, *Con. Icon.*)

Alt. 13-26, diam. 7-11 mm.

Aperture: alt 6-11, diam. 2.5-5.5 mm.

*Hab.* India; Pondichery, Madras (*Blanford*), Poona, Coromandel, Cochin (*Hamley & Theobald*); Ceylon (*Humbert*); also Timor (*Lamarck*); Vanikuro (*Quoy & Gaimard*); Java (*Mousson*); New Guinea (*Less.*); Halmaheira (*Landaner*); also Mauritius and Seychelles.

**Var. *elegans* (*Benson*).**

*Melania elegans*, Benson, J. A. S. B. v, 1836, p. 782, name only for the unnamed turreted form in Gleanings in Science, ii, 1830, p. 22.

*Melania* letter c, Hutton, J. A. S. B. xvii, pt. 1, 1849, p. 657; H. & T., C. I. pl. 73, figs. 5-7; Brot, in *Conch.-Cab.* 1877, p. 274, pl. 28, figs. 9, 9a.

"Testa turrita, solidiuscula, cornea, pallide rubro punctata vel eleganter interrupte flammulata. Spira integra; anfr. 9 convexi, superne subangulati, transverse plicato-costati, plicis ad angulum spinulosis, longitudinaliter lirati, *elegantissima granoso-clathrati*. Apertura ovata, basi subanguste rotundata; columella vix arcuata, margine dextro vix sinuoso." (*Brot*, in *Conch.-Cab.*)

Alt. 16-32, diam. 7.5-12 mm.

Aperture: alt. 7-11, diam. 4-6 mm.

*Hab.* Rivers Gumti, Belwa and Cén.

**61. *Tiara* (*Plotia*) *datura* (*Dohrn*).**

*Tiara* (*Plotia*) *datura* (*Dohrn*), P. Z. S. 1858, p. 135 (as *Melania*); *Reeve*, *Con. Icon.* pl. 32, sp. 213; H. & T., C. I. pl. 73, fig. 10; *Nevill*, *Hand List*, pt. 2, p. 281.

*Original description*:—Testa oblongo-pyramidata, fragilis, diaphana, fusco-nigricans, decollata: anfr. 3-4 ad suturam angulati; supra plani, subtus vix convexi, in angulo longis spinis, infra medium lineis elevatis ornati; apertura cærulea oblonga.

Alt. 21, diam. 11 mm.

Aperture: alt. 10, diam. 5 mm.

*Hab.* Ceylon.

**62. *Tiara* (*Plotia*) *acanthica* (*I. & H. Lea*).**

*Tiara* (*Plotia*) *acanthica* (*I. & H. Lea*), P. Z. S. 1850, p. 194 (as *Melania*); H. & T., C. I. pl. 110, fig. 10; *Nevill*, *Hand List*, p. 281.

*Original description*:—Testa spinosa, ovato-turrita, varicosa, transversim lineata, subtenui, fusca; spira elongata, conica, scalariformi; apice truncata; sutura lineari; anfractibus superne angulatis varicibus distortis; angulo spinis instructo; varicibus magnis

regularibus, subobliquis, superne in spinis productis; spinis longis, tenuibus, irregularibus, extortis; lineis transversis, crebris, parvis, subalternantibus; anfractu ultimo parvo, ad basim lineato; apertura elliptica, inferne effusa; labro inferne producto; columella parva, inferne incrassata.

Alt. 20, diam. 10 mm.

*Hab.* Ceylon; also occurs in the Philippines, Sumatra, etc.

Nevill is his 'Hand List Moll. in Ind. Mus., Calcutta,' p. 281, gives the following varieties, all from the Andaman Islands.

Var. *roepstorffiana*, Nevill.

Long.  $18\frac{3}{4}$ , diam.  $9\frac{3}{4}$  mm.; whorls 7.

Very near M. Brot's pl. 28, fig. 10 A. [Philippines].

Subvar. *brevispira*, Nevill.

Long.  $12\frac{3}{4}$ , diam.  $6\frac{3}{4}$  mm.

Subvar. *subscabra*, Nevill.

Long.  $14\frac{1}{2}$ , diam.  $7\frac{3}{4}$  mm. A connecting link with *Tiara* (*P.*) *scabra*, the spines being rather less developed.

### Subgenus MAINWARINGIA.

*Mainwaringia*, Nevill, Hand List, 1884, pt. 2, p. 286.

TYPE, *Melania* (*Mainwaringia*) *paludomoidea*, Nevill; Gangetic Delta.

Range. Gangetic Delta.

*Original description*:—" . . . . . apparently connecting *Melania* and *Paludomus*, distinguished by the presence of rows of hairs or bristles, especially noticeable on the body whorl, which is ornamented with broad revolving brown bands, not umbilicate; apex remarkably acute, 'quasi styliform'; peristome acute, columella thickened and excavatedly inflected. Operculum transparent, of one substance throughout—that is, without any thickened process for attachment—of very light horn-colour, without sculpture, ovate, acuminate at one end, at the other rounded, and distinctly terminally subspiral, with  $2\frac{1}{2}$  whorls, closely resembling Adams' pl. 35, fig. 10 A-B, operculum of *Hydrobia ulvae*."

### 63. *Tiara* (*Mainwaringia*) *paludomoidea*, Nevill.

*Tiara* (*Mainwaringia*) *paludomoidea*, Nevill, tom. cit.

*Original description*:—" [Shell] imperforate, conically produced, spire turretedly acuminate, apex very acute, suture distinct; of a rather yellowish, bright "horn-colour," girt on the last whorl with three distinct, broad, dark-brown bands, showing clearly within the aperture; spirally regularly striated, below the slight subangulation



of each whorl, the striæ prominent, with a minutely "quasi punctate" appearance, the above becoming somewhat obsolete; covered more or less with rather long and well-developed hairs; whorls nine, the apical three exceedingly minute, white and sculptureless, the next five slightly subangulate a little above the middle, cylindrically turreted, last whorl rather tumidly convex, about the same length as the spire; aperture rather small, vertically ovate, peristome acute, columella thickened, dark violet coloured, inflected obliquely, at base sharply angulate. Operculum as above described; it seems to me slightly convex.

Alt. 9.5, diam. 4 mm.

*Hab.* Mutlah River at Port Canning, in brackish water on trunks of trees submerged at high tide (*Mainwaring*).

### Subfamily PALUDOMINÆ.

Shell solid, ovate or ovately fusiform, imperforate, without basal canal, smooth or spirally striate or lirate.

*Distribution.* India, Ceylon, Malay Peninsula, Borneo.

The above was introduced by Stoliczka in his *Pal. Ind.*, Cretac. Fauna S. India, p. 207, but appears to be a *nomen nudum*, hence the above description by the present author.

### Genus PALUDOMUS.

*Paludomus*, Swainson, Treat. Malac. 1840, p. 340.

TYPE, *Melania globulosa*, Gray; Ceylon.

*Range.* Ceylon; India; Malay Peninsula; Borneo.

Shell oblong-globose, strong; spire shorter than the aperture; inner lip very thick.

The above may be supplemented by Benson's amended description (*Ann. Mag. Nat. Hist.* xvii, 1856, p. 495):—

Testa plerumque imperforata, globoso-ovata, ovato-oblonga, vel ovato-acuta, fere solida, glabra, spiraliter sulcata, vel lirata, interdum spinuloso-costata, epidermide cornea induta; apertura subverticali, ovato-acuta, callo parietali munita, margine columellari, crasso, arcuato, basali integro, interdum subeffuso.

Operculo corneo, concavo; nucleo subspirali insulari, sub-mediano, ad sinistram sito, striis lamellatis concentricis partem majorem disci usurpantibus, circumdato.

#### 64. *Paludomus globulosa* (Gray).

*Paludomus globulosa* (Gray), Griff. ed. Cuvier, Moll. pl. 14, fig. 6 (as *Melania*); Reeve, Con. Icon., *Palud.* sp. 4; H. & T., C. I. pl. 123, fig. 5.

*Original description*:—Shell globular, solid, spire flatly depressed,

whorls swollen round the upper part, smooth throughout; olive, aperture whitish, conspicuously marked with three black bands.

Alt. 24, diam. 21.25 mm. (taken from fig. 4 a, pl. 123, in Con. Icon.).

*Hab.* Kopili River, Assam (*Godwin-Austen*).

"Distinguished from all others at present known by its solid globular form, and is figured and named in Griffith's Cuvier . . . but not described."

The locality given in the Conch. Ind. as "Ambegamoa, Ceylon" is, according to Col. Godwin-Austen, who lent Hanley the specimen from which the species was figured, a mistake, the true locality being as above.

#### 65. *Paludomus sphærica*, Dohrn.

*Paludomus sphærica*, Dohrn, P. Z. S. 1857, p. 124; H. & T., C. I. pl. 124, fig. 8.

*Original description*:—Testa solida, globosa, olivacea, parum nitida, confertim longitudinaliter et transverse striata; spira depressa, exserta; anfractus rotundati, fasciatim spiraliter nigromaculati; sutura simplex, alba.

Alt. 18, diam. 17 mm.

Aperture: alt. 15, diam. 12 mm.

*Hab.* Ceylon.

Still rounder than *P. globulosa*, Gray, and different in the markings and sculpture; *P. globulosa* is in the upper part of the whorls slightly angulated; the whorls of *P. sphærica* are round.

#### 66. *Paludomus conica* (Gray).

*Paludomus conica* (Gray), Griff. ed. Cuvier, Moll. pl. 14, fig. 5 (as *Melania*); Reeve, Con. Icon., *Palud.* sp. 14; Benson, J. A. S. B. v, p. 747 (as *Melania*).

*Melania crassa*, Busch, in Philippi, Abbild. N. Conch. i, *Mel.* pl. 1, figs. 10, 11.

*Paludomus rudis*, Reeve, P. Z. S. 1852, p. 126; H. & T., C. I. pl. 124, fig. 4.

*Original description*:—Testa solida, globoso-conica, longitudinaliter striata plerumque transverse obsolete sulcata; anfractibus, apertum ventricosum, cæteris rapide diminutis; suturis bene signatis; apertura ovata, intus albida, fasciis quibusdam castaneis ornata; labro intus denticulato.

Alt. 27, diam. 21 mm. (taken from fig. 14 c, pl. 3, in Con. Icon.).

*Hab.* Sylhet, Bootan, Assam, etc.

Subvar. *cherraensis*, *Nevill*, Hand List, pt. 2, p. 288.

"A short spired form." . . .

Alt. 16, diam. 13.5 mm.

*Hab.* Teria Ghat (type), (*Godwin-Austen*); Mangken River, Assam (*Godwin-Austen*).

Subvar. *dihiriensis*, *Nevill*, tom. cit.

*Nevill* gives no description other than the following dimensions:—  
Alt. 17·5, diam. 12 mm.

*Hab.* Stream on the Dihiri Hill (Brahmaputra watershed)  
(*Godwin-Austen*).

Subvar. *chittagongensis*, *Nevill*, tom. cit.

“Resembling *M. Brot*’s [figure in *Conch.-Cab.*] pl. ii, fig. 13, but with spire even more produced and the last whorl less tumid.”  
(*Nevill*.)

Alt. 21, diam. 14 mm.

*Hab.* Chittagong (type) (*Raban*).

Var. *sibsaugorensis*, *Nevill*, tom. cit.

“Agrees well with *M. Brot*’s [figs. in *Conch.-Cab.*] pl. viii, figs. 8, 9.”

Var. *pealiana*, *Nevill*, tom. cit.

No description given, other than dimensions.

Alt. 19·5, diam. 15 mm.

*Hab.* Assam (*Robinson*); Sibsagar (*Peal*).

Var. *jaintiaca*, *Nevill*, tom. cit. p. 289.

“Spire not decollate, unusually sharp-pointed.” (*Nevill*.)

Alt. 14·25, diam. 10 mm.

*Hab.* S. Jaintia Hills.

Var. *kopiliensis*, *Nevill*, tom. cit.

“Whorls  $1\frac{1}{2}$  only, the apical ones being decollate, last whorl remarkably inflated, subangulate.” (*Nevill*.)

Alt. 24·5, diam. 21 mm.

*Hab.* Kopih River, North Assam (*Godwin-Austen*); N. Assam  
(*Oldham*).

Subvar. *nana*, *Nevill*, tom. cit.

Presumably a dwarf form.

Alt. 16, diam. 14·5 mm. ( $1\frac{1}{2}$  whorls).

*Hab.* W. Khasi Hills (*Godwin-Austen*).

## 67. *Paludomus paludinoides*, *Reeve*.

*Paludomus paludinoides*, *Reeve*, *P. Z. S.* 1852, p. 127; *H. & T.*,  
*C. I.* pl. 123, fig. 9; *Nevill*, *Hand List*, as *P. conica* var. *palu-*  
*dinoides*, p. 289.

*Original description*:—Testa oblonga, spira subelevata; anfractibus convexis, longitudinaliter lirato-striatis, superne leviter

depressis et marginatis; apertura mediocri; virescenti-olivacea, rufo-nigricante irregulariter fasciata.

The dimensions given below are taken from the figure in the 'Conchologia Indica.'

Alt. 20-25, diam. 15.75 mm.

Hab. Sikkin branch of the Ganges.

Characterized by a fine sculpture of close-set longitudinal ribs.

#### 68. *Paludomus constricta*, Reeve.

*Paludomus constricta*, Reeve, P. Z. S. 1852, p. 129; H. & T., C. I. pl. 126, figs. 1-4.

*Original description*:—Testa subpyramidal-oblonga, solida, spira exserta; anfractibus lævibus vel obscurissime sulcatis, superne concavo-constrictis; olivacea, fascia nigropunctata, moniliformi, versus apicem picta; apertura ovata, callosa, alba.

The dimensions quoted below are taken from fig. 1, pl. 126, in the 'Conchologia Indica.'

Alt. 25.25, diam. 18.5 mm.

Hab. Mountain streams of Ceylon.

Differing "from *P. conica*, to which it is most nearly allied, chiefly by its more oblong and constricted form."

#### 69. *Paludomus ornata*, Benson.

*Paludomus ornata*, Benson, A. M. N. H. (ser. 2) xvii, 1856, p. 496; H. & T., C. I. pl. 108, fig. 8.

*Original description*:—Testa ovato-conica, solidiuscula, læviuscula, striis remotis obsoletis, cincta infra suturam marginatam bisulcata, luteo-olivacea, fasciis 4 fusco-castaneis, suturali angusta, secunda latissima, quarta inconspicua, ornata; spira conica, apice eroso; anfractibus 4 superstitibus convexis, ultimo  $\frac{2}{3}$  testæ vix superante; apertura vix obliqua, ovata, fauce cæruleo-albida, 4 fasciata, superne angulata, angulo intus calloso; peristomate tenui, acuto, marginibus callo albo junctis, columellari subrevoluto, angusto, albo. Operc. — ?

Alt. 18, diam. 13 mm.

Aperture: alt. 13, diam. 8 mm.

Hab. Burma.

#### 70. *Paludomus andersoniana*, Nevill.

*Paludomus andersoniana*, Nevill, J. A. S. B. xlvii, pt. 2, p. 35; loc. cit., 1, pt. 2, p. 160, pl. 5, fig. 2.

*Original description*:—[Shell] large and globose; spire produced and pointed; of a striking greenish-yellow colour, with four intense black bands on the last whorl, the one at the suture and the two near the base about the width of the broadest band on *P. ornata*; the second band from the suture twice this width,

this latter, in all but very old specimens, is very distinctly visible within the aperture; whorls seven, the first two or three generally decollated, transversely superficially ridged, ridges more or less obsolete towards the centre of the upper whorls, one of them below the suture more prominent than the rest; columella pure white; the operculum constantly differs on its inner side from those of the other Burmese species by the remarkably raised and very rugose nucleolar portion and by the distinct, though minute, granular margin.

Alt. max. 29, diam. max. 22 mm.

*Hab.* Mandalay, Ava, Bhamò, Kabuyet, and Myadoung.

NOTE.—The width of the band on *P. ornata*, according to fig. 8, pl. 108, of the Conch. Ind. is nearly a millimetre.

Var. *myadoungensis*, Nevill, J. A. S. B. l, pt. 2, p. 160.

*Original description*:—"A small decollate and prettily marked variety, with the whorls markedly more rounded."

Alt. 15, diam. 12 mm.

*Hab.* Myadoung, near the Yunnan Frontier.

Subsp. *peguensis*, Nevill, J. A. S. B. xlv, pt. 2, p. 35.

*Paludomus regulata*, Benson, var., H. & T., C. I. pl. 108, fig. 6.

*Original description*:—"Differs from the preceding [*P. anderssoniana*] by the slightly more rugose sculpture, by its more decollated apex, by the less cylindrical whorls and less produced and pointed spire (more apparent in young specimens), by the columella being apparently invariably faintly stained with brown, by the almost entire apparent absence of colouration on the last whorl, especially in the absence of the second broad band within the aperture.

Alt. 21, diam. 16 mm.

*Hab.* Pegu.

"The specimen figured in the Conch. Indica is a very old decollated one."

Subvar. *nana*, Nevill, J. A. S. B. l, pt. 2, p. 160.

*Original description*:—"Spiral sculpture a trifle less distinct."

Alt. 15, diam. 11 mm.

*Hab.* Pegu.

#### 71. *Paludomus regulata*, Benson.

*Paludomus regulata*, Benson, A. M. N. H. ser. 2, xvii, 1856, p. 496; H. & T., C. I. pl. 108, fig. 5.

*Original description*:—"Testa ovato-acuta, solidiuscula, regulatim distincte spiraliter sulcata, interstitiis latis planatis, minutissime confertissimeque decussato-striatis, sulcis 2-3 prope suturam latoribus profundioribus, pallide lutea, fasciis subquatuor, tertia latori, ornata; spira elata, conica, apice acuto; anfractibus 6,

convexiusculis, ultimo dimidium testæ vix superante; apertura verticali, ovata, superne angulata, albida, intus 4-fasciata, peristomatis margine dextro recto acuto, ætate intus vix incrassato-marginato, parietali calloso, columellari versus basin subdilatato, appresso. Operc. ut in sp. typ.

Alt. 19-24, diam. 12-14 mm.

Aperture: alt. maj. 13, diam. 9 mm.

Hab. Thyet-Myo, Burma.

Nevill in his 'Iland-list,' on p. 391, cites a

Subvar. *minor*, *Brot*, *Conch.-Cab.* pl. 7, fig. 16.

Alt. 15.25, diam. 10 mm.

Hab. Burma.

## 72. *Paludomus blanfordiana*, *Nevill*.

*Paludomus blanfordiana*, Nevill, J. A. S. B. xlv, pt. 2, p. 37; op. cit., 1, p. 159, pl. 5, fig. 3.

Allied to *P. labiosa*, Benson, but larger and more angularly globose than that species, the columella is less vividly stained with brown, the brown bands are more regular and distinct, and neither young nor old specimens are truncate; the sculpture of both is the same, quite smooth except for a few irregular spiral striæ below the suture.

Alt. 19, diam. 15 mm. (type).

Hab. Ava; Assam.

An Assam specimen measures, according to Nevill:—Alt. 20, diam. 15 mm.

## 73. *Paludomus petrosa* (*Gould*).

*Paludomus petrosa* (*Gould*), *Proc. Boston Soc. Nat. Hist.* i, 1844, p. 144 (as *Paludina*).

*Paludomus labiosa*, Benson, A. M. N. H. ser. 2, xvii, 1856, p. 495; Nevill, J. A. S. B. 1, pt. 2, p. 159, pl. 5, fig. 5.

*Original description*:—Testa solida, imperforata, subglobosa, apice erosa, saturate viridi, rufo-fasciata; anfract. 3, ultimo amplo, sutura præcipue marginata; apertura semi-circulari, columella late planulata, rufescente; intus nigrescente vel holoserica; operculo apice subcentrali, elementis concentricis.

Alt. 13, diam. 10.5 mm.

Hab. Burma (*Mason*).

## 74. *Paludomus burmanica*, *Nevill*.

*Paludomus burmanica*, Nevill, J. A. S. B. xlv, pt. 2, p. 36; op. cit., 1, pt. 2, p. 160, pl. 5, fig. 4.

*Original description*:—Shell small, very thick, spire depressed,

in shape closely resembling the European *Litorina obtusata*; only two whorls, the others decollated in both young and old specimens; smooth, with a few irregular striæ at suture; columella very thick, pure white; aperture somewhat compressed as in typical *P. labiosa* [= *petrosa*], not globosely expanded as in *P. blanfordiana*; in all the ten specimens found, only three instead of four bands, the upper one exceedingly broad, covering nearly half the last whorl, the middle one narrow, the basal one broad, but not diffused over any part of the columella; these bands are of the most intense black within the aperture, even in very old, thick specimens; epidermis unusually thick, dark olive-green, closely covered with regular raised pustules of a lighter colour.

Alt. 14·5, diam. 12 mm.

Hab. Yaylaymaw and Mandalay.

#### 75. *Paludomus stephanus* (Benson).

*Paludomus stephanus* (Benson), J. A. S. B. 1836, v, p. 747 (as *Melania*); Reeve, Con. Icon., *Palud.* sp. 11.

*Melania coronata*, v. d. Busch, in Philippi, Abbild. N. Conch. i, *Mel.*, pl. 1, figs. 5, 6, H. & T., C. I. pl. 122, fig. 10.

*Original description*:—Testa ovato-conica, gradata, plerumque deinde truncata, globoso-ovata, olivacea, anfractibus obsolete fasciatis, transverse sulcatis, superne planulatis, spiris brevibus validis coronatis; apertura albida subrotundata, superne fere angulata; labro subdenticulato.

Alt. 15·5, diam. 14·75 mm. (taken from fig. in Con. Icon.).

A considerably larger shell is depicted in the 'Conchologia Indica,' of which the following are the dimensions:—

Alt. 19·75, diam. 19·25 mm.

Hab. Bengal.

#### 76. *Paludomus reticulata*, *Blanford*.

*Paludomus reticulata*, Blanford, J. A. S. B. 1870, xxxix, pt. 2, p. 9, pl. 3, fig. 1; H. & T., C. I. pl. 108, fig. 4.

*Original description*:—Testa imperforata, globosa, solida, albida, epidermide fusca induta, liris reticulati spiralibus et verticalibus decussato-sculpta, litarum intersectionibus nodiferis. Spira brevis; apice eroso; sutura profunda. Anfr. superst. 2-3 convexi, ultimus infra suturam tumidus. Apertura ovalis, postice vix subangulata, parum obliqua, intus cærulescens; peristoma tenue, acutum fere rectum, ad basin vix retrocurvatum, intus minute corrugatum, margine basali expansiusculo; columella mediocri. Operc. normale.

Alt. 19, diam. maj. 17, diam. min. 13·5 mm.

Aperture: alt. 13·5, diam. 10 mm.

Hab. Cachar.

"This is an ally of *P. stephanus*, Benson, so far as form is concerned, but it differs widely in sculpture, and although that is not a character of much importance in the genus *Paludomus* and its allies, still, as no intermediate forms between the two are known, it appears quite justifiable to separate them."

#### 77. *Paludomus obesa* (Philippi).

*Paludomus obesa* (Philippi), Abbild. Neue Conch. ii, 1842, p. 170, *Melania*, pl. 4, fig. 3 (as ? *Melania*)

*Paludomus maculatus*, Lea, Proc. Acad. Nat. Sci. Philad. viii, p. 110.

*Rivukna maculatus*, Lea, Journ. Acad. Philad. ser 2, vi, p. 118, pl. 20, fig. 10; H. & T., C. I. pl. 126, figs. 7, 10.

*Original description*:—Testa oblonga, tenuiuscula, lutescente, punctis rufo-fuscis per series transversas dispositis picta; anfractibus 4, præter summos erosos, convexis, superne subangulatis; apertura ovato-oblonga; labro perpendiculari, recto; columella arcuata, incrassata.

Alt. 13·25, diam. 10 mm.

*Hab.* Bombay, Ahmednuggur (Conch. Ind.).

#### 78. *Paludomus chilinoides*, Reeve.

*Paludomus chilinoides*, Reeve, Con. Icon., *Palud.* sp. 7, pl. 2, fig. 7 a, & pl. 3, figs. 7 b, c.

*Paludomus phasianinus*, Reeve, P. Z. S. 1852, p. 127.

*Paludomus parvus*, Layard, P. Z. S. 1854, p. 90; H. & T., C. I. pl. 123, fig. 2.

*Original description*:—Shell ovate, rather thin, spire small, exserted, whorls depressed round the upper part, smooth; olive, longitudinally waved with black, aperture white.

Alt. 17·5, diam. 13·5 mm. (taken from pl. 3, fig. 7 c, in Con. Icon.).

*Hab.* Bed of the Mahawelle Ganga, near Kandy, Ceylon; Uda Pussellawa, Ceylon (*Preston*).

"Found abundantly in the stream above noted; the chief variation of form consists in the whorls being more or less depressed round the upper part, after the manner of a *Chilina*, with the spire varying considerably in its elevation."

#### 79. *Paludomus lævis*, Layard.

*Paludomus lævis*, Layard, P. Z. S. 1854, p. 89; H. & T., C. I. pl. 108, fig. 3; Nevill, Hand List, pt. 2, p. 293 (as *P. chilinoides* var. *lævis*).

*Original description*:—Shell oblong-ovate, axis 11 lines, diam. lines; spire acute, exserted, moderately long; whorls rounded, not depressed round the upper part, smooth. Colour olive-yellow, the lower whorls seldom marked, but the upper always spotted



with one or two rows of arrow-headed dots; apex bluish; aperture white.

Operculum as in *P. chilinoides*, Reeve.

*Hab.* Ceylon, in slow-running streams on the northern side of the mountain-zone extending into the flat country beyond Anarajahpoora. I also obtained a few in a paddy-field in the south of the island, near the village of Heneratgodde.

Possibly a variety of *P. chilinoides*, from which it "only differs in wanting the depression round the upper part of the whorls and in the colouring." It is found in the same localities as that species.

### 80. *Paludomus zeylanica* (Lea).

*Paludomus zeylanica* (Lea), P. Z. S. 1850, pp. 194-195 (as *Melania*).

*Original description*.—Testa lævi, ovata, crassa, nitida, albida aut virido-fusca; badio flammulata, spira brevi, acuminata, apice acuta, aliquando erosa; sutura lineari; anfractibus quinque, convexis, ad suturam superiorem impressis, maculis flammulatis aut sagittatis badiis; anfractu ultimo magno, bullato; basi lævi; apertura ovato-rotunda, superne angulata, inferne rotundata, intus albida; columella magna, alba, superne incrassata, inferne curvata.



Fig. 3.—*Paludomus zeylanica* (Lea).

Alt. 22·75, diam. 14·75 mm.

*Hab.* Ceylon (also reported from the Seychelles).

"The markings are very variable, being sometimes oblique, zigzag lines, extending over the whole surface of the whorls, sometimes sagittate or short zigzag spots in transverse series. Indeed, some specimens are of a uniform dark green. The last whorl sometimes has two impressed transverse lines. The mouth is nearly two-thirds the length of the shell."

### 81. *Paludomus fulgurata*, Dohrn.

*Paludomus fulgurata*, Dohrn, P. Z. S. 1857, p. 123; II. & T., C. I. pl. 123, fig. 1.

*Original description*.—Testa oblongo-ovata, tenera; spira elevata, apice obtuso, leviter longitudinaliter et spiraliter striata, læte olivacea, fusco fulgurata, ad suturam impressam fusco fasciata;

anfractus quatuor convexi, supra medium obsolete carinati; apertura oblonga, simplex, albida, lineis fuscis, pellucetibus. Operc. — ?

Alt. 16, diam. 13 mm.

Aperture: alt. 11, diam. 6 mm.

Hab. Ceylon.

## 82. *Paludomus palustris*, Layard.

*Paludomus palustris*, Layard, P. Z. S. 1854, p. 89; H. & T., C. I. pl. 126, figs. 2, 3.

*Original description*:—Shell ovate, thin; axis 10 lines, diam. 6 lines; spire exserted, long; whorls rounded, rather flat, spirally closely grooved with minute granular striæ (visible under the lens). Colour of adult shell a rich yellow spotted with dark brown, the markings frequently running into wavy lines; apex bluish; aperture white. Operculum nearly oval, the apex slightly inclined to the left; concentric nucleus subcentral, sinistral.

Hab. The grassy margins of a tank at Anarajahpoora, Ceylon.

In young shells the ground colour is almost hidden by the dark markings, and the aperture is found to be spirally marked with thin lines of the same colour.

## 83. *Paludomus tanschaurica*, Gmelin.

*Paludomus tanschaurica*, Gmelin, Syst. Nat. 3655, for the *Helix fluviatilis tanschaurensis* of Chemn., Conch.-Cab. ix, p. 174, fig. 1243.

*Helix fluviatilis*, Dillwyn, Desc. Cat. Shells, p. 959; H. & T., C. I. pl. 123, fig. 8.

*Paludomus tanjoriensis*, H. F. Blanford, emend. Trans. Linn. Soc. 1863, p. 173, pl. 27, figs. 2 a-e.

*Original description*:—Testa subturrita, brunnea, glaberrima, anfractibus septem, maculis obscurioribus seu nigricantibus conspersa, ore subrotundo, fauce albicante.

Alt. 16, diam. 13 mm. (taken from fig. in 'Conchologia Indica').

Hab. India.

Var. *kadapaensis*, Nevill, Hand List, pt. 2, p. 294.

"Apparently without sculpture; apex not acute; spire pointed, of four to five whorls, longitudinally, regularly, handsomely flamed, somewhat as in *P. parva*, Layard [= *chilinoidea*, Reeve], but in a less "zigzag" manner." (Nevill.)

Alt. 15.5, diam. 9.75 mm. (spire slightly eroded only).

Hab. Kadapa District, Madras (King).

Var. *malabarica*, Nevill, tom. cit.

"Decollate and in shape exactly resembling the Ceylon var.

*palustris* [*P. palustris*, Layard]; decussating striæ, however, obsolete in the adult, as in the typical Madras form, spiral striation very variable in amount of development." (*Nevill*.)

Alt. 16.5, diam. 11.5 mm. (decollate, three whorls only remaining).

*Hab.* Travancore (*Beddome*); Pulney Hills (*Fairbank*).

#### 84. *Paludomus monile*, Thorpe MSS., Hanley.

*Paludomus monile*, Thorpe MSS., H. & T., C. I. pl. 108, fig. 10 (fig. only).

Shell fusiformly turbinate, small, yellowish-olive, painted with interrupted spiral lines and bands of reddish-purple; remaining whorls  $3\frac{1}{2}$ , regularly increasing, sculptured with spiral lines crossed by transverse striæ which present a somewhat decussate appearance; suture impressed, callously and decussately margined below; columellar margin descending in a curve, whitish, extending above into a thickish, well-defined, parietal callus which reaches to the upper margin of the labrum; labrum acute, bevelled inwardly at the base; aperture ovate; interior of shell showing the reddish-purple bands through the test.

Alt. 12.5, diam. maj. 9, diam. min. 7 mm.

Aperture: alt. 6.75, diam. 4 mm.

*Hab.* Southern India.

Type in British Museum.

#### 85. *Paludomus rotunda*, Blanford.

*Paludomus rotunda*, Blanford, J. A. S. B. 1870, xxxix, pt. 2, p. 10, pl. 3, fig. 2; H. & T., C. I. pl. 108, fig. 2.

*Original description*:—Testa non rimata, globosa, rotunda, solida, epidermide fusca induta, sub-laevigata, striis incrementi et liris sub-obsoletis confertis, minutis, spiralibus decussantibus signata; spira brevissima; apice erosulo; sutura vix impressa. Anfr.  $2\frac{1}{2}$ –3 rapide crescentes, primi parum convexi, ultimus valde major, tumidus, antice non descendens, subtus convexus. Apertura sub-obovalis, postice angulata, obliqua, intus fasciis 2–3 intrantibus ornata; peristoma simplex, acutum, margine basali expansiusculo; columella albida, callosa, lata. Operc. normale.

Alt. 15, diam. maj. 14 mm.

*Hab.* Travancore.

Var. *microstoma*, *Nevill*, Hand List, pt. 2, p. 295.

No other description than dimensions given.

Alt. 11, diam. 10 mm. (much eroded,  $1\frac{1}{2}$  whorls only remaining).

*Hab.* Anamallay Rivers (*Beddome*); Madura Hills (*Beddome*).

86. *Paludomus inflata*, Brot.

*Paludomus inflata*, Brot, Conch.-Cab. ii, 1879, p. 44, pl. 8, figs. 25, 26; Nevill, Hand List, pt. 2, p. 295.

*Original description*:—Testa globosa-turrita, solidiuscula, lutescenti-olivacea, profuse et distincte nigro undulatim fasciata et punctata. Spira erosa, sat exserta, anfr. 3 persist. declivi-convexusculi, longitudinaliter inæqualiter sulcati; anfr. ultimus subito globose dilatatus, sulcis longitudinalibus superficialibus, infra suturam constrictus deinde gibboso-inflatus. Apertura late ovata, intus vivide maculata et strigata, superne acuminata, basi obtuse subangulata; columella arcuata incrassata; callo parietali distincto; margine dextro acuto, superne impresso, deinde valde arcuato. Opercul. typicum.

Alt. 18, diam. 14 mm. (eroded, 3 whorls remaining).

Aperture: alt. 11, diam. 7 mm.

*Hab.* Travancore (*Hanley, Beddome*); Amerghat; Tinnevely (*Beddome*).

87. *Paludomus striatula*, Nevill.

*Paludomus striatula*, Nevill, Hand List, pt. 2, p. 297.

"In Brot's pl. 7, figs. 7, 8, in the Conch.-Cab., *P. isseli* from Borneo gives an exact representation of this new and rare Ceylon form; the well-developed, crowded, almost granulose spiral striation will at once distinguish it." (*Nevill*.)

Alt. 18, diam. 13.5 mm. (Strongly decollate, two whorls only remaining).

*Hab.* Ceylon (type) (*H. Nevill*).

Brot's figures appear to depict a conically fusiform, solid, light-brown form, with yellowish labrum and aperture; they do not, however, give any appearance of spiral sculpture.

88. *Paludomus travancorica*, Blanford.

*Paludomus travancorica*, Blanford, J. A. S. B. xlix, pt. 2, p. 219, pl. 2, fig. 22.

*Original description*:—Shell imperforate, ovately conical, rather thick, covered with a dark-brown epidermis; beneath the epidermis white, with narrow vertical, very wavy dark purple stripes; all the whorls spirally ribbed, the ribs rather close together, with the interspaces smooth, the striæ of growth being inconspicuous. Spire conical, apex eroded (doubtless acute when perfect), suture impressed. Whorls remaining 3 (probably in the perfect shell 5 or 6), convex, the last exceeding half the length of the shell. Aperture nearly vertical, ovate, angulate at the posterior extremity, bluish white, with conspicuous, close, vertical, wavy, deep purple bands within; peristome in one plane, the external margin

the columellar and basal margins white, thickened within, and dilated. Operculum normal.

Alt. (apex wanting) 23 (when perfect about 25), diam. maj. 16, min. 13.5 mm.

Aperture: alt. 12, diam. 9 mm.

Hab. Streams traversing the plains between Trevandrum and the foot of the Aghastyamali.

In a young specimen of *P. travancorica*, there appears to be a tendency to the development of minor parallel ribs between those forming the spiral sculpture, and the latter are rather closer together near the suture."

### 639. *Paludomus annandalei*, Preston.

*Paladomus annandalei*, Preston, Rec. Ind. Mus., Calcutta, iii, 1909, p. 277 (figs. in text).

Original description:—Shell conoidal, upper whorls eroded, solid, dark olivaceous brown, a paler yellowish brown band appearing at the periphery, above this obscurely painted with regular, transverse, vertical, deep chestnut flammules and below with very oblique flammules of the same colour; remaining whorls about 3, sculptured with revolving, spiral liræ rather coarser just below the sutures and disappearing altogether or becoming obsolete towards the periphery, but reappearing on the base of the shell, the interstices between the liræ having a somewhat punctate appearance; sutures lightly impressed; columella arched, white and diffused into a minutely granular callus which joins the upper lip and is thickened almost into a nodule above; peristome acute, scarcely serrated; interior of shell bluish white, showing the rows of flammules distinctly; operculum spirally laminiferous, with subcentral nucleus.

The dimensions of the three specimens taken as the type series are as follows:—

	1.	2.	3.
Alt. ....	24 mm.	22 mm.	21.5 mm.
Diam., maj. ....	18 "	17 "	16 "
Aperture: alt. ..	16 "	13 "	12.5 "
diam...	9.5 "	8 "	8 "

Hab. Tenmalai, W. Ghats (W. side), Travancore (rocky mountain stream (N. Annandale).

Types in Indian Museum.

### 640. *Paludomus spiralis*, Reeve.

*Paludomus spiralis*, Reeve, Con. Icon., *Palud.* p. 15, pl. 3, fig. 15.

Original description:—Shell ovate, spire large, prominent, whorls rounded, smooth; olive, spotted here and there with black, interior white.

Alt. 17.5, diam. 12.5 mm. (taken from Con. Icon.).

Hab. Streams of Ceylon.

91. *Paludomus maurus*, *Reeve*.

*Paludomus maurus*, Reeve, P. Z. S. 1852, p. 127; H. & T., C. I. pl. 124, figs. 2, 3.

*Original description*:—Testa subacuminato-turbinata, spira prominente; anfractibus rotundatis, superne subexcavatis et obsolete lineatis; apertura parva; castaneo-fusca, immaculata.

The following dimensions are taken from fig. 3, pl. 124 in the 'Conchologia Indica.'

Alt. 21, diam. 22 mm.

*Hab.* Branch of the Ganges.

92. *Paludomus pyriformis*, *Dohrn*.

*Paludomus pyriformis*, Dohrn, P. Z. S. 1858, p. 536; H. & T., C. I. pl. 125, figs. 2, 3.

*Original description*:—Testa solidiuscula, pyriformis, læte olivacea, striis viridibus brunneisque ornata, decussata; sutura striis aliquot valde impressis circumdata; anfractus 4 convexiusculi, ultimus  $\frac{3}{4}$  spiræ subæquans; apertura oblonga, margine columellari arcuato albido, striis pellucetibus.

Alt. 21, diam. 15 mm.

Aperture: alt. 15, diam. 9.5 mm.

*Hab.* Ceylon.

93. *Paludomus clavata*, *Reeve*.

*Paludomus clavata*, Reeve, P. Z. S. 1852, p. 129; H. & T., C. I. pl. 123, fig. 4.

*Original description*:—Testa oblongo-ovata, utrinque attenuata, crassa, ponderosa, spira breviuscula, conica; anfractibus lævibus conico-declivibus; nigricanti-olivacea; apertura subdilatata, callosa, alba.

The dimensions according to the figure in the 'Conchologia Indica' are as below:—

Alt. 20, diam. 12.5 mm.

*Hab.* Mountain streams of Ceylon; Uda Pussellawa, Ceylon (*Preston*).

94. *Paludomus lutosa*, *Souleyet*.

*Paludomus lutosa*, Souleyet, Voy. 'Bonite,' Zool. ii, p. 550, pl. 31, figs. 28-30; H. & T., C. I. pl. 123, fig. 6.

*Original description*:—Testa oblongo-conica, olivacea, nitida; spira conico-acuta; anfractibus septenis, supra depressiusculis; duobus inferioribus ventricosus, penultimo basi spiraliter sulcato, ultimo in medio multi-sulcato; apertura ovato-acuta, intus cæru-

lescente; labro incrassato, albo; labro acuto. Operculum corneum, fusco-nigrum, concentricè striatum.

Alt. 20, diam. 14 mm.

*Hab.* Ganges.

According to a note appended to the original description the animal is of a blackish-brown colour.

95. *Paludomus nasuta*, Dohrn.

*Paludomus nasuta*, Dohrn, P. Z. S. 1857, p. 123; H. & T., C. I. pl. 124, fig. 7.

*Original description*:—Testa solida, oblongo-conica, apice acuto, nigrescens, versus apicem albicans, ad suturam linea valde impressa distincta, obsolete decussata; anfractus quatuor convexiusculi, ultimus medio leviter angulatus; apertura simplex, oblonga, albida. Operc. — ?

Alt. 12, diam. 8 mm.

Aperture: alt. 7·5, diam. 4·5 mm.

*Hab.* Ceylon.

96. *Paludomus abbreviata*, Reeve.

*Paludomus abbreviata*, Reeve, P. Z. S. 1852, p. 127; H. & T., C. I. pl. 125, fig. 7.

*Original description*:—Testa abbreviato-ovata, solida, Neritinæ-formi, spira brevissima; anfractibus superne plano-declivibus, deinde convexis, lævibus; apertura subampla; olivacea, lineis duabus fuscis interdum obsolete cingulata, aperturæ fauce fasciata.

The following measurements are taken from the figure in the 'Conchologia Indica':—

Alt. 20·5, diam. 16 mm.

*Hab.* Ceylon.

Of a solid *Neritina*-like form.

97. *Paludomus acuta*, Reeve.

*Paludomus acuta*, Reeve, P. Z. S. 1852, p. 127; H. & T., C. I. pl. 123, fig. 7.

*Original description*:—Testa acuminata-turbinata, spira acuta; anfractibus rotundatis, ad suturam excavatis et lineatis, medio lineis incisis cingulatis; apertura parva, virescenti-olivacea.

The measurements of the figure in the 'Conchologia Indica' are as below:—

Alt. 17·25, diam. 10·75 mm.

*Hab.* Near Pondicherry.

The apex of the shell, which in most species is eroded, is here sharply developed. The whorls are characterized by being encircled round the middle with conspicuous engraved lines.

98. *Paludomus baccula*, Reeve.

*Paludomus baccula*, Reeve, P. Z. S. 1852, p. 128; Hanley, Conch. Misc., *Melan.* fig. 63; H. & T., C. I. pl. 124, fig. 10.

*Original description*:—Testa oblongo-turbinata, spira prominente, anfractibus, plano-convexis, lævigatis, vel, sub lente, subtilissime striatis; apertura parva; olivacea, brunneo-nigro tincta.

The dimensions according to the figure in the 'Conchologia Indica' are as follows:—

Alt. 17, diam. 11 mm.

*Hab.* Branch of the Ganges.

A small dark olive turbinated species, besmeared with shining brown-black.

Subgenus **PHILOPOTAMIS**.

*Philopotamis*, Layard, A. M. N. H. ser. 2, xvi, 1855, p. 134.

TYPE, *Paludomus sulcata*, Reeve; Ceylon.

Range. Ceylon.

*Original description*:—Animal fluviatile, amphibious, delighting in rocky torrents. Operculum horny, subtriangularly ovate; apex superior, paucispiral; nucleus sub-basal, dextral.

The subgenus is based upon the characters of the operculum.

99. *Paludomus (Philopotamis) sulcata* (Reeve).

*Paludomus (Philopotamis) sulcata* (Reeve), Con. Icon., *Palud.* sp. 8; H. & T., C. I. pl. 122, fig. 2.

*Original description*:—Shell ovate, spire prominent, whorls rounded, spirally very closely grooved, grooves and intermediate ridges very closely decussated with longitudinal striæ; yellowish olive, painted here and there with black, sometimes entirely black, interior whitish.

Alt. 25, diam. 20 mm. (taken from pl. 3, fig. 8c in Con. Icon.).

*Hab.* In a mountain stream at Ratnapoora, Ceylon; Uda Pussellawa, Ceylon (*Preston*).

Subvar. *minor*, *Nevill*, Hand List, pt. 2, p. 299; cf. *Brot*, Conch.-Cab. ii, pl. 5, fig. 18.

Apparently a small form.

Alt. 14.5, diam. 11.5 mm. (according to *Brot's* figure).

*Hab.* Ceylon (*Stoliczka*).

Var. *contracta*, *Nevill*, tom. cit.; *Brot*, Conch.-Cab. ii, pl. 5, figs. 19, 20 (as "*P. sulcatus*, var.").

*Nevill* gives no description beyond the reference to *Brot's* figure; it appears to be a narrow form.

*Hab.* Ambegammoa, Ceylon (*Blanford*).



Var. *compacta*, *Nevill*, tom. cit.

"Remarkable for its small aperture." (*Nevill*.)

Alt. 16·5, diam. 11·75 mm.

*Hab.* Ceylon (*H. Nevill*).

100. *Paludomus* (*Philopotamis*) *decussata* (*Reeve*).

*Paludomus* (*Philopotamis*) *decussata* (*Reeve*), P. Z. S. 1852, p. 127;  
H. & T., C. I. pl. 123, fig. 3.

*Original description*:—Testa acuminato-oblonga, tenuiuscula, spira subacuta; anfractibus convexis, striis minutis longitudinalibus et transversis undique subtilissime decussatis; apertura parviuscula; virescenti olivacea, fasciis tribus rufo-nigricantibus cingulata.

The dimensions given below are taken from the figure in the 'Conchologia Indica':—

Alt. 23·5, diam. 22 mm.

*Hab.* Ceylon.

Chiefly characterized by its finely decussated surface.

101. *Paludomus* (*Philopotamis*) *trifasciata* (*Reeve*).

*Paludomus* (*Philopotamis*) *trifasciata* (*Reeve*), P. Z. S. 1852, p. 126;  
H. & T., C. I. p. xvii.

*Original description*:—Testa oblonga, spira subelevata; anfractibus plano-convexis, undique costellato-striatis; apertura



Fig. 4.—*Paludomus* (*Philopotamis*) *trifasciata*, *Reeve*.  
(Specimen.) Nat. size.

parviuscula, intus vix callosa; olivacea, fasciis tribus nigricantibus subirregulariter cingulata.

Alt. 21, diam. maj. 14 mm.

Aperture: alt. 13, diam. 9·5 mm. (specimen).

*Hab.* Branch of the Ganges.

102. *Paludomus* (*Philopotamis*) *bicincta* (*Reeve*).

*Paludomus* (*Philopotamis*) *bicincta* (*Reeve*), P. Z. S. 1852, p. 129;  
H. & T., C. I. pl. 123, fig. 10.

*Original description*:—Testa globosa vel oblongo-globosa, longi-

tudinaliter subobscure sulcato-striata, spira brevi; anfractibus convexis superne subdepressis, et minute spiraliter sulcatis, olivaceo-fusca, nigricante obscure bifasciata; apertura albida.

The dimensions according to the figure in the 'Conchologia Indica' are as follows:—

Alt. 17.5, diam. 14 mm.

*Hab.* Mountain streams of Ceylon.

"Allied to *P. decussata*, but of more acuminate growth."

### 103. *Paludomus (Philopotamis) rupæformis* (Brot).

*Paludomus (Philopotamis) rupæformis* (Brot), Conch.-Cab. ii, p. 30, 1880, pl. 5, fig. 10; Nevill, Hand List, pt. 2, p. 298.

*Original description*:—Testa globoso-mucronata, solidula, corneo-olivacea, nigro inquinata, unicolor. Spira subintegra, parvula, breviter concavo-mucronata; anfr. 6 (integræ ad 7) convexi, sutura distincta divisi, lævigati, lente crescentes; ultimus subito inflatus, globosus, sublævigatus vel striis incrementi tenuibus vix striatulus. Apertura ovata, superne acuminata, basi rotundata, intus alba, vel pallide late bifasciata; columella arcuata, crassiuscula. Operculum typicum.

Alt. 16, diam. 12 mm.

Aperture: alt. 10.5, diam. 6 mm.

*Hab.* Matala, Ceylon (*Layard*).

### 104. *Paludomus (Philopotamis) regalis*, *Layard*.

*Paludomus (Philopotamis) regalis*, *Layard*, P. Z. S. 1854, p. 93; H. & T., C. I. pl. 121, fig. 10.

*Original description*:—Shell oblong ovate; axis 1 inch, diam. 9 lines. Spire exserted, short. Whorls rounded, depressed at the upper part, spirally corded with close-set slight ridges, longitudinally minutely striated, and crowned with a single row of short, sharp, hollow, angular spines, closely set. Colour yellowish-olive, painted with wavy, dark brown longitudinal lines. Aperture pure white.

Operculum unknown, but most probably as in *P. sulcata*.

*Hab.* Stream in the Cnia Corle, Western Province, Ceylon.

### 105. *Paludomus (Philopotamis) nigricans* (Reeve).

*Paludomus (Philopotamis) nigricans* (Reeve), Con. Icon., *Palud.* sp. 6; H. & T., C. I. pl. 124, fig. 1.

*Original description*:—Shell ovate, spire rather prominent, exserted; whorls smooth, faintly angled towards the base; blackish, interior bluish white.

Alt. 13.75, diam. 9.25 mm. (taken from fig. in Conch. Icon.).

*Hab.* Ceylon (in mountain streams at 6,000 feet elevation).

Var. *subgranulosa*, Nevill, Hand List, pt. 2, p. 299; Brot, Conch.-Cab. ii, 1880, pl. 6, fig. 6 (as var. B).

No other description given than that implied by the name.

*Hab.* Ceylon (*Blanford*).

106. *Paludomus (Philopotamis) erronea*, Nevill.

*Paludomus (Philopotamis) erronea*, Nevill, Hand List, pt. 2, p. 300; H. & T., C. I. pl. 108, fig. 7 (as *P. parva*) [not of Layard].

*Paludomus phasianinus*, Layard, A. M. N. II. 1855, p. 136 [not of Reeve].

"The only ally, I know, of *Paludomus erronea* is *P. nigricans* of which Mr. H. F. Blanford considers it a smooth variety; the above-quoted figure, however, shows the differences at a glance."

Alt. 10·5, diam. 6·5 mm.

*Hab.* Hackgalle [*Hakgalla*], Ceylon (*Layard*); Ceylon (*Blanford*).

107. *Paludomus (Philopotamis) subdentata*, Nevill.

*Paludomus (Philopotamis) subdentata*, Nevill, Hand List, pt. 2, p. 300.

*Original description*:—Almost smooth, prettily longitudinally striped, "flames" only slightly flexuous; columella very broadly excavated, alabaster white, subdentate at base; spire truncate, two whorls only remaining, the last one convexly swollen; flames are discernible within the aperture.

Alt. 13·75, diam. 9·75 mm.

*Hab.* Ceylon (type) (*H. Nevill*).

108. *Paludomus (Philopotamis) violacea* (*Layard*).

*Paludomus (Philopotamis) violacea* (*Layard*), P. Z. S. 1854, p. 92, (as *Tanahia*); Brot, in Conch.-Cab. ii, 1880, p. 15, pl. 5, figs. 3, 3 a, 3 b.

*Original description*:—Shell globose; axis 6 lines, diam. 5 lines. Spire very short, slightly exserted. Whorls rounded, ventricose, spirally grooved with close-set, fine, minutely decussated striæ (in one variety the striæ become ridges). Colour a dark bluish-brown, almost amounting to black, with darkish brown patches appearing in some specimens. Aperture deep violet inside; columella white, stained on the outside edge with dark brown.

*Hab.* A small mountain torrent in a dense forest between Gillymalle and Pallabaddoola, towards Adam's Peak, Ceylon.

Subgenus **TANALIA**.

*Tanalia*, Gray, P. Z. S. 1847, p. 153; Layard, op. cit. 1854, p. 88.

TYPE, *Nerita aculeata*, Chemnitz; Ceylon.

Range. Ceylon.

*Original description*:—Animal fluviatile, delighting in the most rapid mountain torrents. Operculum horny, subtriangularly ovate; apex lateral, lamellated; nucleus lateral, dextral.

As in the subgenus *Philopotamis*, the present subgenus is also based upon the structure of the operculum.

109. *Paludomus (Tanalia) loricata* (Reeve).

*Paludomus (Tanalia) loricata* (Reeve), Con. Icon. iv, *Palud.* sp. 1.

*Paludomus ærea*, Reeve, P. Z. S. 1852, p. 128.

*Tanalia loricata*, Layard, P. Z. S. 1854, p. 91.

*Paludomus layardi*, Reeve, l. c.

*Paludomus undata*, Reeve, Con. Icon. iv, *Palud.* sp. 2; H. & T., C. I. pl. 121, fig. 3 as *P. undata*, fig. 5 as *P. ærea*, fig. 6 as *P. layardi*.

*Original description*:—Shell obovate, spire scarcely exerted, whorls slightly angularly depressed round the upper part, spirally encircled with close-set squamate ridges; aperture large; very black-brown, interior white, columella and edge of the lip purple-brown.

Alt. 20·5, diam. 20·5 mm. (from original figure 1 a).

Alt. 32·25, diam. 34·5 mm. ( " " 1 b).

*Hab.* In rapids flowing from Adam's Peak, Ceylon (*Gardner*).

110. *Paludomus (Tanalia) erinacea* (Reeve).

*Paludomus (Tanalia) erinacea* (Reeve), P. Z. S. 1852, p. 128;

H. & T., C. I. pl. 121, fig. 1; Nevill, Hand List, pt. 2, p. 301

(as *P. (Tanalia) aculeata* var. *erinacea*).

*Original description*:—Testa obovata, tenuiuscula, anfractibus convexis, liris muricato-squamatis spiralliter cingulatis; apertura subampla; atra, intus cærulescente, columella et aperturæ limbo castaneo-nigris.

The following dimensions are taken from the figure in the 'Conchologia Indica.'

Alt. 21·5, diam. 21 mm.

*Hab.* Mountain streams of Ceylon.

111. *Paludomus (Tanalia) nodulosa* (Dohrn).

*Paludomus (Tanalia) nodulosa* (Dohrn), P. Z. S. 1857, p. 125;

H. & T., C. I. pl. 126, figs. 8, 9; Nevill, Hand List, pt. 2,

p. 302 (as *P. (T.) aculeata* var. *nodulosa*).

*Original description*:—Testa oblongo-ovata, læte olivacea, longitudinaliter nigro fulgurata; spira exserta; anfractus costis

tuberculosis spiraliter cingulati, sutura crenulata; apertura subcircularis, nigra, intus albida, lineis nigris pellucidibus.

Alt. 27, diam. 21 mm.

Aperture: alt. 20, diam. 16.5 mm.

Hab. Ceylon.

112. *Paludomus (Tanalia) reevei*, Layard.

*Paludomus (Tanalia) reevei*, Layard, P. Z. S. 1884, p. 92; H. & T., C. I. pl. 121, fig. 7, and pl. 124, fig. 5, Nevill, tom. cit. (as *P. (T.) nodulosa* var. *reevei*).

*Original description*:—Shell oblong-ovate; axis  $1\frac{1}{2}$  inch, diam. 1 inch 2 lines. Spire exserted, short. Whorls rounded, spirally corded with rather distant obtuse ridges, longitudinally striated with well-marked close-set striæ, the great characteristic mark of the species. Aperture: outer lip edged with deep purple-brown, columellar lip white. Colour a dark yellow-brown, thickly marked with longitudinal, slanting, jet-brown wavy bands.

Hab. The Calloo Ganga, Ratnapoora [Kaluganga, Ratnapura], Ceylon.

Subvar. *minor*, Nevill, Hand List, pt. 2, p. 302.

No description is given by Nevill, but presumably it is a small form.

Hab. Ceylon (*H. F. Blanford*).

113. *Paludomus (Tanalia) funiculata*, Reeve.

*Paludomus (Tanalia) funiculata*, Reeve, Conch. Icon., *Palud.* sp. 13. *Tanalia funiculata*, Layard, P. Z. S. 1854, p. 93 (amended description); H. & T., C. I. pl. 125, figs. 1-4; Nevill, tom. cit. (as *P. (T.) aculeata* var. *funiculata*).

*Original description*:—Shell oblong-ovate, spire exserted, whorls rather depressed round the upper part, spirally corded with rather distant obtuse ridges; jet-brown, interior whitish.

Alt. 25, diam. 22 mm. (taken from fig. in Con. Icon.).

Hab. In a mountain stream at Ratnapoora, Ceylon.

“Of a dark sombre colour, without any indication of pattern, encircled throughout with rather distant ridges.”

114. *Paludomus (Tanalia) picta*, Reeve.

*Paludomus (Tanalia) picta*, Reeve, Conch. Icon., *Palud.* sp. 10; H. & T., C. I. pl. 122, fig. 7; Nevill, tom. cit. p. 303 (as *P. (T.) aculeata* var. *picta*).

*Original description*:—Shell oblong-ovate, spire exserted, whorls spirally obtusely striated: olive, painted longitudinally with narrow undulated waved bands, interior white, margin of the columella stained with brown.

Alt. 23·5, diam. 19·25 mm. (taken from pl. 2, fig. *a* in Con. Icon.).

*Hab.* In a mountain stream at Ratnapoora, Ceylon.

"The waved painting may be observed in adult specimens on the outside, when not visible in the interior."

115. *Paludomus (Tanalia) swainsoni* (Dohrn).

*Paludomus (Tanalia) swainsoni* (Dohrn), P. Z. S. 1857, p. 125 ;  
H. & T., C. I. pl. 124, fig. 6.

*Original description* :—Testa ovata, solida, olivacea, costis nigris spiralibus ornata, obsolete spiraliter et longitudinaliter striata ; spira exserta ; anfractus convexi, ad suturam nigricantem depressi ; apertura ovata, albida, obsolete dentata, interdum fusco-maculata.

Alt. 25, diam. 23 mm.

Aperture : alt. 21, diam. 12 mm.

*Hab.* Ceylon.

Allied to *P. (T.) picta*, but differing in having black ribs.

116. *Paludomus (Tanalia) distinguenda* (Dohrn).

*Paludomus (Tanalia) distinguenda* (Dohrn), P. Z. S. 1857, p. 124,  
H. & T., C. I. pl. 122, fig. 3 ; Nevill, Hand List, pt. 2, p. 303  
(as *P. (T.) aculeata* var. *distinguenda*).

*Original description* :—Testa ovata, olivacea, nitida, fasciis nigris fulguratis longitudinaliter picta, spiraliter et longitudinaliter striata ; spira exserta ; apertura ovata, cærulescens ; peristomata nigro, obsolete dentato ; margine columellari planato, fasciis nigris, pellucentibus.

Alt. 25, diam. 19 mm.

Aperture : alt. 18, diam. 12·5 mm.

*Hab.* Ceylon.

117. *Paludomus (Tanalia) torrenticola*, Dohrn.

*Paludomus (Tanalia) torrenticola*, Dohrn, P. Z. S. 1858, p. 536 ;  
H. & T., C. I. pl. 124, fig. 9 ; Nevill, Hand List, pt. 2, p. 303  
(as *P. (T.) aculeata* var. *torrenticola*).

*Original description* :—Testa oblongo-ovata, nigricanti-olivacea, obscure fulgurata et maculata, spirahter confertim, longitudinaliter rarius striata ; spira exserta ; anfractus convexi ; sutura simplex ; apertura ovalis, violacea, margine columellari albo.

Alt. 22, diam. 16 mm.

Aperture : alt. 16, diam. 12 mm.

*Hab.* Ceylon.

118. *Paludomus (Tanalia) neritoides* (Reeve).

*Paludomus (Tanalia) neritoides* (Reeve), Conch. Icon., *Palud.* sp. 3; H. & T., C. I. pl. 122, fig. 8.

*Original description*:—Shell oblong-ovate, spire a little exserted, whorls rounded. obscurely obtusely ridged; aperture rather large; olive, sharply waved in the young shell with brown, interior white, columella and edge of the lip sometimes blotched here and there with blackish brown.

Alt. 31·5, diam. 24·5 mm. (taken from pl. 1, fig. 3*b* in Con. Icon.).

*Hab.* In the bed of a river at Ambegamoa, Ceylon.

“This species has more the form of a *Nerita* than any other, and is distinguished in an early stage of growth by a brilliant pattern of zigzag painting in the interior. The lip and columella are sometimes white, sometimes blotched with blackish brown.”

Var. *globosa*, Brot, Conch.-Cab. ii, 1880, pl. 8, fig. 1; Nevill, Hand List, pt. 2, p. 304.

A somewhat swollen form.

*Hab.* Ceylon (Nevill).

119. *Paludomus (Tanalia) dilatata* (Reeve).

*Paludomus (Tanalia) dilatata* (Reeve), P. Z. S. 1852, p. 128; H. & T., C. I. pl. 125, figs. 5, 6; Nevill, Hand List, pt. 2, p. 303 (as *P. (T.) neritoides* var. *dilatata*?).

*Original description*:—Testa suboblongo-ovata, spira exsertiuscula; anfractibus rotundatis, superne vix depressis, spiraliter obscura superficialiter lralis; intense nigricanti-fusca, immaculata; apertura oblonga, inferne dilatata, intus cærulescenti-alba, bi- vel trifasciata, nigro-limbata.

The following dimensions are taken from fig. 5, pl. 125, in the ‘Conchologia Indica.’

Alt. 36·75, diam. 29 mm.

*Hab.* Mountain streams of Ceylon.

120. *Paludomus (Tanalia) gardneri* (Reeve).

*Paludomus (Tanalia) gardneri* (Reeve), Conch. Icon., *Palud.* sp. 9; H. & T., C. I. pl. 122, fig. 6; Nevill, tom. cit. (as *P. (T.) neritoides* var. *gardneri*).

*Original description*:—Shell orbicularly ovate, spire flatly depressed, whorls regularly convex, very closely spirally ridged, ridges rather thin, obtuse, alternately larger; aperture very large; jet-black, interior whitish, columella and margin of the aperture stained with purple-black.

Alt. 35, diam. 34 mm. (taken from pl. 2, fig. 9*b* in Con. Icon.).

*Hab.* In a stream at the foot of Adam’s Peak, Ceylon.

121. *Paludomus (Tanalia) cumingiana* (Dohrn).

*Paludomus (Tanalia) cumingiana* (Dohrn), P. Z. S. 1857, p. 124;  
H. & T., C. I. pl. 126, figs. 5, 6.

*Original description*:—Testa globosa, solida, olivaceo-fusca, obsolete spiraliter sulcata; spira valde depressa, exserta; anfractus ultimus ceteros superans, ad suturam in formam canalis impressus; apertura magna, obliqua, flavescens, intus albida, lineis nigris undatis longitudinaliter distincta.

Alt. 33, diam. 34 mm.

Aperture: alt. 30, diam. 24 mm.

*Hab.* Ceylon.

Allied to *P. (T.) gardneri*, Reeve, but distinguished by the "deep channel-like impression on the upper part of the whorl, and in the large size of the mouth."

122. *Paludomus (Tanalia) thwaitesi* (Layard).

*Paludomus (Tanalia) thwaitesi* (Layard), P. Z. S. 1854, pp. 93-94 (as *Philopotamis*); H. & T., C. I. pl. 125, figs. 8, 9, Nevill, Hand List, pt. 2, p. 304 (as *P. (T.) neritoides* var. *thwaitesi* ?).

*Original description*:—Shell oblong-ovate; axis 13 lines, diam. 9 lines. Spire exserted, short. Whorls almost carinated round the upper part, spirally corded with unequal sized, close, but irregularly set ridges, granulated or minutely striated. Colour yellowish olive, banded more or less with wavy, dark brown longitudinal lines. Aperture pinkish white, occasionally having the outer lip dotted with dark pink-brown marks.

Alt. 30.5, diam. 23.75 mm. (Conch. Ind. pl. 125, fig. 9).

*Hab.* Weyweldenia, Ceylon.

123. *Paludomus (Tanalia) tennantii* (Reeve).

*Paludomus (Tanalia) tennantii* (Reeve), Con. Icon., *Palud.* sp. 12; H. & T., C. I. pl. 122, fig. 5 (as *P. tennentii*), Nevill, *loc. cit.* (as *P. (T.) neritoides* var. *tennenti*).

*Original description*:—Shell obovate, rather thick, spire scarcely exserted; whorls rounded, smooth, or very obscurely ridged, aperture rather largely effused; olive, indistinctly longitudinally waved, interior white, columella and edge of the aperture stained with purple-brown.

Alt. 31, diam. 29 mm. (taken from pl. 3, fig. c, in Con. Icon.).

*Hab.* In a rocky stream flowing from Adam's Peak, Ceylon.

"... distinguished in early growth by an elaborate pattern of waved painting, which is very conspicuous in the interior of the shell. At a more advanced period, this striking display of pattern is entirely obscured by a superincumbent deposit of colourless matter."



124. *Paludomus (Tanalia) dromedarius (Dohrn)*.

*Paludomus (Tanalia) dromedarius* (Dohrn), P. Z. S. 1857, p. 124; H. & T., C. I. pl. 122, fig. 9; Nevill, tom. cit. (as *P. (T.) neritoides* var. *dromedarius*).

*Original description*:—Testa oblongo-ovata, nigra, obsolete spiraliter, longitudinaliter striata; anfractus convexi, ultimus antice valde deflexus; apertura subcircularis, alba, obsolete dentata, interdum flavocincta. Operculum subtriangulare, corneum, nucleo laterali dextrorso.

Alt. 29, diam. 21 mm.

Aperture: alt. 20·5, diam. 16 mm.

*Hab.* Ceylon.

125. *Paludomus (Tanalia) solida (Dohrn)*.

*Paludomus (Tanalia) solida* (Dohrn), P. Z. S. 1857, p. 124; H. & T., C. I. pl. 122, fig. 4.

*Original description*:—Testa ovato-oblonga, solidissima, flava, brunneo-maculata; spira exserta; anfractus convexi, spiraliter sulcati, sublente longitudinaliter striati; sutura impressa; apertura crassa, alba, semicircularis. Operculum corneum, nigrescens, concentrice striatum, nucleo sinistro.

Alt. 19, diam. 14·5 mm.

Aperture: alt. 13, diam. 10 mm.

*Hab.* Ceylon.

126. *Paludomus (Tanalia) hanleyi (Dohrn)*.

*Paludomus (Tanalia) hanleyi* (Dohrn), P. Z. S. 1858, p. 535; H. & T., C. I. pl. 125, fig. 10.

*Original description*:—Testa semiovalis, neritæformis, solida, olivacea unicolor vel saturatius longitudinaliter striata, decussata; spira exserta; anfractus convexi; apertura obliqua, ampla, labio columellari magno, margine interno vix curvato, externo semicirculari; alba vel flavescens. Operc. ?

Alt. 18, diam. 15 mm.

Aperture: alt. 15, diam. 13 mm.

*Hab.* Ceylon.

Var. major, ? *Nevill*, Hand List, pt. 2, p. 305.

A large form.

Alt. 23, diam. 20 mm.

*Hab.* Ceylon (*H. Nevill*).

127. *Paludomus (Tanalia) skinneri (Dohrn)*.

*Paludomus (Tanalia) skinneri* (Dohrn), P. Z. S. 1857, p. 124; H. & T., C. I. pl. 121, fig. 4.

*Original description*:—Testa ovata, nigricanti-olivacea, confertim

costis squamatis spiraliter cingulata, supra medium obsolete carinata; apertura semicircularis, alba, intus cærulescens.

Alt. 35, diam. 32 mm.

Aperture: alt. 29, diam. 21 mm.

Hub. Ceylon.

128. *Paludomus (Tanalia) similis*, Layard.

*Paludomus (Tanalia) similis*, Layard, P. Z. S. 1854, p. 92; H. & T., C. I. pl. 122, fig. 1.

*Original description*:—Shell rather globose; axis 8 lines, diam. 6 lines. Spire short, exserted. Whorls rounded, ventricose, spirally grooved with close-set, fine, minutely decussated striæ. Colour rich olive-yellow, profusely marked with longitudinal, wavy, dark lines, interrupted by four or five fine transverse bands of the same colour. Aperture: the dark markings of the shell show through, and are dimmed by a bluish haze; columella lip white, stained on the outside edge with dark brown, which runs round the outer lip in a thin band.

*Hab.* A mountain torrent at Kandangamoa, near Ratnapoora, Ceylon.

129. *Paludomus (Tanalia) melanostoma*, Hanley & Theobald.

*Paludomus (Tanalia) melanostoma*, Hanley & Theobald, Con. Ind. pl. 121, figs. 8, 9 (figs. only).

Shell oblong-ovate, solid, dark yellowish-brown, painted with oblique, transverse, zigzag bands of black; remaining whorls 3, rapidly increasing, the last large, sculptured with more or less beaded, spiral hræ; suture impressed; columella margin excavated, white within, stained with brownish-black without, extending upwards into a thickish, well-defined, parietal callus which has the same colouring and reaches to the upper margin of the labrum; labrum edged with a variegated band of brown and yellowish white just within, acute; aperture ovate; interior of shell white.

Alt. 25, diam. maj. 21·25, diam. min. 15·25 mm.

Aperture: alt. 20, diam. 11·25 mm.

Hub. Ceylon.

Type in British Museum.

Subgenus **STOMATODON.**

*Stomatodon*, Benson, A. M. N. H. ser. 3, x, 1862, p. 414.

TYPE, *Paludomus stomatodon*, Benson; Travancore.

Range. Travancore.

For description see that of *Paludomus (S.) stomatodon* given below.

130. *Paludomus (Stomatodon) stomatodon*, Benson.

*Paludomus (Stomatodon) stomatodon*, Benson, A. M. N. H. ser. 3, x, 1862, p. 414 (as ? *Tanalia*); H. & T., C. I. pl. 108, fig. 1.

*Original description*:—Testa ovato-globosa, solida, læviuscula (juniorum polita), striis spiralibus obsoletis induta, olivaceo-nigrescente; spira brevi erosa, sutura impressa; anfractibus 3 superstitibus, superioribus convexiusculis, ultimo convexo; apertura ovato-acuta, albida, intus demum angustiore, sinuata; peristomate integro, margine dextro basaliq̄ue acuto, columellari late calloso, infra latiore, subito intus truncato, dente prominente crasso munito.

Alt. 14, diam. 12 mm.

*Hab.* Mountain streams near Cottyam, Travancore.

“ . . . There is some resemblance in this shell to *Neritina*, for which genus a specimen might, on a cursory glance, be taken. The upper part of the columellar callosity exhibits in some specimens a blackish-brown tint, and a patch of the same colour may occasionally be observed at the base, in the interior of the aperture, the throat of which is tinged with violet and purple and presents a minutely corrugate surface.”

## Family LITTORNIDÆ.

## Subfamily CREMNOCONCHINÆ.

Shell ovate, depressedly turbate, with large aperture.

*Distribution.* S. Asia.

## Genus CREMNOCONCHUS.

*Cremnobates*, Blanford, A. M. N. H. ser. 3, xii, 1863, p. 184.

*Cremnoconchus*, Blanford, A. M. N. H. ser. 4, iii, 1869, p. 343.

TYPE, *C. syhadrensis*, Blanford; Western India.

Range. W. India; Tonkin.

*Original description*:—Testa perforata, turbinato-globosa, costulata. Apertura mediocris, subovata; peristomatis margine dextro simplici, columellari vix calloso.

Operculum testaceum, subovatum, paucispirale; nucleo sinistro; margine membranaceo.

Animal (pulmoniferum?) parvum; tentaculis duobus brevibus subulatis, oculos in lobis tumidis ad basin gerentibus præditum.

Pes brevis, rotundatus. Proboscis brevis.

131. *Cremnoconchus syhadensis* (Blanford).

*Cremnoconchus syhadensis* (Blanford), A. M. N. H. ser. 3, xii, 1863, p. 184 (as *Cremnobates*), pl. 4, figs. 1-7; H. & T., C. I. pl. 146, fig. 6.

*Original description*.—Testa subobtecte perforata, globoso-turbinata, costulis elevatis crenulatis circumdata, inter costulas liris minoribus spiraliibus lineisque obliquis decussantibus incrementi ornata, periomphalo haud costulato concentrice decussato-striato albida, ad apicem rubella, epidermide viridi-fusca induta; spira brevis, conoidea, sutura impressa, apice acuto, plerumque erosulo; anfractibus 3, rapide accrescentibus, convexis, ultimo rotundato, circa perforationem angulato; apertura diagonalis, ovata, lineis longitudinalibus fusco-purpureis prope suturam et versus basum marginis dextri, spatio interveniente, interne signata, interdum omnino colorata; peristoma simplex, marginibus callo junctis, dextro recto, basili expansulo, columellari reflexo, appresso perforationem partim tegente. Operculum normale.

Alt. 7, diam. 7 mm.

Aperture: alt. 5, diam. 4 mm.

*Hab.* Western Ghats. On wet rocks (Blanford).

With regard to the animal the author doubts the existence of gills and makes the following remarks: "... the large vascular sac at the back of the neck exactly resembles that in the operculated land-shells. The mantle-margin is free, and the sexes distinct. The lingual ribbon is very long; one from a large specimen measured  $\frac{3}{4}$  inch (17 mill.); the teeth are 7-ranked, but differ in form from those of Cyclostomaceous genera. The amphibious habits of the animal, the short foot, and the olive-green epidermis, so characteristic of fresh-water shells, induce me to place it in the vicinity of *Lithoglyphus*."

132. *Cremnoconchus conicus*, Blanford.

*Cremnoconchus conicus*, Blanford, J. A. S. B. xxxix, pt. 2, 1870, p. 10, pl. 3, figs. 3, 3 a; H. & T., C. I. pl. 146, figs. 8, 9, and *C. conicus* var. fig. 10, *fide* Blanford, J. A. S. B. xlix, pt. 2, p. 221.

*Original description*.—Testa imperforata, ovato-conica, solida, albida, fascia spirali castanea supra peripheriam interdum ornata, epidermide olivacea, haud nitida, induta. Spira conica; apice acuto, plerumque eroso; sutura profunda. Anfr. 5 convexi (primi sæpissime carentes), ultimus ad peripheriam sub-angulatus, subtus convexus, non descendens. Apertura obliqua, ovata, postice subangulata, intus fulvenscens vel alba, aliquando fascia castanea intranti instructa; peristoma tenue rectum, marginibus callo junctis, basali sub-effuso, columellari calloso. Operc. normale, corneum, pauci-spirale, nucleo sub-basali, haud procul a latere columellari sito.

Alt. 8, diam. 6 mm. } A young specimen with  
 Aperture : alt. 4.5, diam. 3.5 mm. } perfect spire.  
 Alt. 9.5, diam. 7 mm. } An old specimen with eroded  
 Aperture : alt. 6, diam. 5 mm. } spire.  
*Hab.* Near Poonah.

Var. *canaliculatus*, *Blanford*, J. A. S. B. xxxix, pt. 2, 1870, p. 11, pl. 3, fig. 4.

*Original description* :—Sutura canaliculata, anfractibus juxta suturam acute carinatis.

Alt. 8, diam. 6.5 mm.

*Hab.* Torna.

### 133. *Cremnoconchus carinatus* (*Layard*).

*Cremnoconchus carinatus* (*Layard*), P. Z. S. 1854, p. 94 (as *Anculotus*); *Blanford*, J. A. S. B. xxxix, pt. 2, 1870, p. 12, pl. 3, fig. 5; op. cit. xlix, pt. 2, p. 221.

*Original description* :—Shell somewhat globose; axis 5 lines, diam. 4 lines. Spire exerted, short. Whorls inflated, rather square, sharply keeled round the inferior angle, minutely longitudinally striated. Colour dull olive, marked faintly with two or three broad bands of dark rufous-brown, which are very apparent in the aperture; columellar lip white, stained with a light dash of the same rufous-brown on the exterior margin.

No dimensions being given the following is taken from *Blanford's* description (J. A. S. B. xxxix, pt. 2, p. 12).

Alt. 7.5, diam. 5 mm.

*Hab.* Streams in the Mahableshwar Hills, Bombay Presidency.

### Subgenus BITHINELLA.

*Bithinella*, *Moquin-Tandon*, 1851, J. de Conch. Paris, p. 239, & Hist. Moll. Terr. Fluv. France, 1855, p. 516 (as *Bythinella*).

TYPE, *Bulimus viridis*, *Poiret*; Europe.

Range. Europe; Asia; N. America.

Shell having the operculum set far back in the interior; it is also subcorneous, spirally striate, with excentric nucleus.

### 134. *Bithinella canningensis*, *Preston*.

*Bithinella canningensis*, *Preston*, A. M. N. H. ser. 7, xix, 1907, p. 216 (fig. in text).

*Original description* :—Shell subperforate, pyramidal, dull yellowish-brown horn-colour; remaining whorls 3, somewhat convex; sutures well impressed; aperture oval; peristome simple, continuous; operculum horny, paucispiral.

Alt. 1.75, diam. maj. 1 mm.

*Hab.* Port Canning, Lower Bengal; in brackish pools.

Type in Indian Museum, Calcutta.

Family PALUDESTRINIDÆ [= *Hydrobiidæ*].

## Subfamily PALUDESTRININÆ.

Shell small, corneous, fusiform, narrowly rimate or imperforate.  
*Distribution.* World-wide.

## Genus PALUDESTRINA.

*Hydrobia*, Hartmann, 1821, *nec* Leach in *Coleoptera*, 1817.

*Paludestrina*, d'Orbigny, *Voy. Amér. Mérid*, Moll. 1840, p. 381.

TYPE, *P. auferiana*, d'Orb.; S. America.

*Range.* World-wide.

Animals having no eyes on the tentacles, these being placed outwardly at their base; operculum horny, spiral, resembling *Littorina*. An inhabitant of both fresh and brackish water.

## Subgenus BELGRANDIA.

*Belgrandia*, Bourguignat, *Cat. Moll. Ter. Fluv. Env. Paris*, 1869, p. 15.

TYPE, *Bithinella gibba*, Draparnaud; France.

*Range.* Europe; Asia.

Shell having one or two rounded swellings on the last whorl, these, as the author explains at some length, being quite different from those caused by rest periods.

135. *Paludestrina* (*Belgrandia*) *miliacea*, Nevill.

*Paludestrina* (*Belgrandia*) *miliacea*, Nevill, J. A. S. B. xlix, pt. 2, p. 161; op. cit., 1, p. 158, pl. vii, fig. 7; Nevill, *Hand List*, pt. 2, p. 52 [as *Hydrobia* (*Bythinella*)].

*Original description*:—Testa minuta, vix rimata, conico-elongatula, solida, parum nitida, albido-viridula, lævigata; spira paululum producta, apice minuto, acutiusculo; anfr. 5, convexiusculi, ultimis duobus rapide accrescentibus, ultimo basi subplanulato, ad aperturam gibbositate crassa circumscripto; apertura ovato-rotundata, intus incrassata, peristoma continuum, valide incrassatum, margine externo arcuato, basi sinuato, margine columellari subangulatum contorto, subreflexo. Operculum sat profunde immersum, tenue, pellucidum, vitreum.

Alt. about 2.75, diam. 1.75 mm.

*Hab.* Port Canning (*Nevill, Mainwaring*).

Type in Indian Museum, Calcutta.

Subvar. *gibbosula*.

*Hab.* Port Canning (*Stoliczka*).

Subvar. *subangulata*.

*Hab.* Port Canning (*Nevill*); Chilka Lake (*Blanford*).

The above two subvarieties are given by *Nevill* in his 'Hand List,' p. 52, but without further descriptions than those implied by the names themselves.

Var. *minor*, *Nevill*, J. A. S. B. 1880, pt. 2, p. 161.

Alt. 2, diam. 1.25 mm.

*Hab.* Port Canning.

Genus *TRICULA*.

*Tricula*, Benson, Calcutta Journ. Nat. Hist. 1843, p. 467.

TYPE, *T. montana*, Benson; India.

Range. India.

*Original description*:—Testæ spira elongatiuscula, apertura obliqua, ovata, integra superne angulata; peristomate continuo, subreflexo; anfractu ultimo subumbilicato.

*Animal*. *Melania* simile, proboscide elongata. antice emarginata, tentaculis filiformibus duobus oculos postice prope basin gerentibus; pede mediocri ovato, antice subquadrato. Operculo corneo subspirali.

136. *Tricula montana*, Benson.

*Tricula montana*, Benson, Calcutta Journ. Nat. Hist. 1843, p. 467; A. M. N. H. 1862, pp. 415-416; H. & T., C. I. pl. 155, fig. 1.

*Original description*:—Testa olivacea ovato-conica, anfractibus sex rotundatis, suturis impressis, apertura intus albida, peristomate nigrescenti; apice obtuso, plerumque decollato.

Alt. 3, diam. maj. 1.25 mm.

*Hab.* Bhimtal.

*Nevill* (*Hand List Moll. Ind. Mus.*, Calcutta, p. 62) cites a presumably short variety under the name var. *curta*, but without other description; it is from the Jhiri Valley, N. Cachar, at an altitude of 3000 feet.

Genus *AMNICOLA*.

*Amnicola*, Gould & Haldeman, Rep. Inv., Mass., 1841, p. 228.

TYPE, *A. porata*, Say; Massachusetts.

Range. N. America; E. & S. Asia.

*Original description*:—Shell ovate-conic, thin; spire acute, composed of a few rounded whorls; aperture small, oblique, rounded-ovate; lips continuous, simple; operculum horny, spiral, with a few volutions.

Animal having an elongated foot, rounded posteriorly, with each anterior angle produced laterally; head half the breadth of the foot, and protruding beyond it; tentacula short, filiform, unequal, ? the eyes seated at the side of the external base; oviparous. Inhabits fresh water.

137. *Amnicola cincta*, Gould.

*Amnicola cincta*, Gould, Proc. Bost. Soc. Nat. Hist. ii, p. 100; Otia Conch. p. 199.

*Original description*:—Testa minuta, tenuis, ovato-oblongata, imperforata, pallide cornea, decollata: anfr. (superstitibus) 3, ventricosis, ultimo magno, subcarinato, lineis volventibus, et interdum fascia fusca, cincto: apertura ovata, basi admodum producta, labro simplici.

Alt. 2 mm.

*Hab.* Tenasserim, Burma.

Unfortunately no actual specimen has been accessible to the author of the present work; hence the impossibility of illustrating this hitherto unfigured species.

138. *Amnicola parvula* (Hutton).

*Amnicola parvula* (Hutton), J. A. S. B. xviii, pt. 2, p. 655 (as *Paludina*).

*Bithinia globula*, Lea, Proc. Acad. Philad. 1856, viii, p. 110, & Journ. Acad. Philad., n. s., vii, p. 119, pl. 22, fig. 12 (= Obs. *Unio*, xi probably); H. & T., C. I. pl. 151, figs. 8, 9.

*Original description*:—Animal dusky grey.

Shell conoid, of four whorls exclusive of apex; colour of epidermis dull or dusky green; aperture ovate, rounded below, angular above; oblique; operculum horny; subumbilicate, pillar lip partially reflected; sutures deep; epidermis of the upper whorls usually eroded; transversely striated by fine lines of growth.

Alt. 4.5 mm.

*Hab.* A marshy patch of ground caused by a spring oozing from the side of the Kojuck Pass, at Chummun.

### Subfamily LITHOGLYPHINÆ.

Animal with simple foot; radula with several basal denticulations; penis simple or forked; operculum horny, spiral or subspiral.

*Distribution.* S.E. Europe; S.E. Asia; C. Africa; N., S. and C. America; Melanesia.



Genus **LITHOGLYPHUS**.

*Lithoglyphus*, Hartmann, Sturm's Fauna, 1821, vi, Heft 5, p. 57.

TYPE, *L. eburneus*, Meg. v. Mühlfeld; Europe.

Range. Europe; India; Tonkin.

Shell imperforate, globular with short spire, solid, suture lightly impressed; aperture large, subovate or nearly circular; labrum simple; columellar margin callous; operculum horny, paucispiral, with excentric nucleus.

139. *Lithoglyphus martabanensis*, Theobald.

*Lithoglyphus martabanensis*, Theobald, J. A. S. B. xxxix, 1870, pt. 2, p. 402, pl. 18, fig. 9; H. & T., C. I. pl. 81, fig. 10.

*Original description*:—Testa globose conica, imperforata, solida, virescente albida, translucente, fere lævi, transversim exilissime striata, spira parva, regulari, subobtusa; anfractibus  $4\frac{1}{2}$ , celeriter crescentibus, ultimo  $\frac{2}{3}$  longitudinalis æquante, apertura elliptica, antice rotundata, postice angulata. Columella callosa, polita, paulo dilatata, labro acuto leviter curvato, antice ad latus subtruncato.

Alt. 4 mm. (fig. in Conch. Ind.).

Hab. Martaban.

Subfamily BITHYNIINÆ [*Bithiniinæ* emend.].

Animal with simple foot; radula with several basal denticulations; penis bifid; operculum calcareous, concentric.

*Distribution*. Europe; Asia.

Genus **BITHYNIA**.

*Bithynia*, Leach, in Abel's "Narrative of Journey into Interior of China," 1818, p. 362.

TYPE, *Helix tentaculata*, Linnæus; Europe.

Range. Europe; Asia.

Shell small, ovately fusiform with more or less convex whorls; aperture oval; labrum continuous; operculum testaceous.

140. *Bithynia tentaculata* (Linnæus).

*Helix tentaculata*, Linnæus, Syst. Nat. ed. 10, 1758, p. 774.

*Nerita jaculator*, Muller, Verm. Hist. pt. 2, 1774, p. 185.

*Turbo nucleus*, Da Costa, Brit. Conch. 1778, p. 91, pl. 5, fig. 12.

*Bulimus tentaculatus*, Poiret, Coq. de l'Aisne, 1801, p. 61.

*Cyclostoma impurum*, Draparnaud, Tabl. Moll. 1801, p. 41.

*Turbo janitor*, Vallot, Exerc. d'Hist. Nat. 1801, p. 6.

*Cyclostoma jaculator*, Férussac, Ess. Méth. Conch. 1807, p. 66.

*Lymnæa tentaculata*, Fleming, Edin. Encyc. vii, 1814, p. 78.

- Paludina impura*, Brard, Coq. Paris, 1815, p. 183, pl. 7, fig. 2.  
*Paludina jaculator*, Studer, Kurz. Verz. 1820, p. 91.  
*Turbo tentaculatus*, Sheppard, Trans. Linn. Soc. xiv, 1823, p. 152.  
*Bithynia jaculator*, Risso, Hist. Nat. Eur. Mérid. iv, 1826, p. 100.  
*Paludina tentaculata*, Fleming, Brit. Anim. 1828, p. 315.  
*Bithynia tentaculata*, Gray, Turton Man. 1840, p. 93, pl. 10, fig. 120.  
*Bithynia (Elona) tentaculata*, Moquin-Tandon, Hist. Moll. ii, 1855, p. 528, pl. 39, figs. 23, 24.  
*Bythinia tentaculata*, Reeve, Brit. L. & F. W. Moll. 1863, p. 189.

"Shell: conically ovate, with a minute nearly closed umbilicus, fulvous green, subtransparent, apex rather sharp; whorls five, smooth, convex, the last rather ventricose; aperture somewhat pyriformly ovate, lip dark-edged, scarcely reflected. Operculum subtestaceous, striated concentrically around a central nucleus." (Reeve.)

*Hab.* Throughout Europe (in gentle streams and still waters).

Nevill gives the following variety without other description than the dimensions:—

**Var. *kashmirensis*.**

Alt. 7, diam. 4·5 mm.

*Hab.* Kashmir (*Stoliczka*); Srinagar (Kashmir) (*Theobald*?).

**141. *Bithynia cerameopoma* (Benson).**

*Bithynia cerameopoma* (Benson), Gleanings in Science, Calcutta, ii, p. 125 (name for sp. in vol. i, p. 362) (as *Paludina*); J. A. S. B. xxiv, 1855, p. 131.

*Bithynia ceranospatana*, Frauenfeld, Verhandl. zool.-bot. Wien, 1862, p. 1156; H. & T., C. I. pl. 38, figs. 1, 4.

*Original description*:—Small, ovate-oblong, whitish-yellow, subhyaline, the lip at the base of the columella slightly produced; operculum calcareous.

The above meagre description may be supplemented by the following, based on a specimen in the British Museum:—

Shell oblong-ovate, cinereous shading to yellowish white; whorls 5, regularly and rather rapidly increasing, convex, minutely and obsoletely sculptured with very fine, spiral striæ and marked with rather weak growth lines; suture well impressed; umbilicus moderately narrow, deep; labrum continuous, slightly reflexed, bevelled within; aperture a little oblique, ovate; operculum shelly, slightly concave, with subcentral nucleus, having about seven convolutions.

Alt. 10·75, diam. maj. 9, diam. min. 6 mm.

Aperture: alt. 6, diam. 4·25 mm.

*Hab.* Bengal.

There is in the British Museum a second set of this species, presented by Captain T. Hutton and labelled "Plains—India." The shells in this set are of rather smaller dimensions than those

to which the specimen above described belongs, and are all of a dark colour, varying from light chestnut to yellowish-brown.

Nevill, in his 'Hand List of Mollusca in the Indian Museum,' p. 34, quotes two subvarieties, as below:—

**Var. carinulata.**

Apparently a deformed specimen from Assam.

**Var. gigantea.**

No description, but presumably a large form from Calcutta.

**142. *Bithynia travancorica*, Benson.**

*Bithynia travancorica*, Benson, A. M. N. H. ser. 3, vi, 1860, p. 259; H. & T., C. I. pl. 38, figs. 2, 3.

*Original description*.—Testa imperforata, conoideo-globosa, irregulariter striata, striis minutissimis spiralibus confertim decussata, albida, vel corneo-flavescente, translucente; spira dimidium testæ æquante, apicem versus conoidea, vertice obtusiusculo hyalina, sutura impressa; anfractibus  $4\frac{1}{2}$  convexis, ultimo globoso, antice sensim descendente; apertura obliqua, ovata, margine sinistro calloso, callo extus sulco marginato. Operculo normali, crassiusculo, extus nonnunquam tenuiter radiatim striato; nucleo subcentrali.

Alt. 6, diam. 5 mm.

*Hab.* Ponds near Quilon.

**143. *Bithynia lutea*, Gray.**

*Bithynia lutea*, Gray, Ann. Phil. 1824, p. 277.

*Bithynia goniostoma*, Hutton MSS.

*Paludina pulchella*, Küster (not Benson), ed. Chemn. *Paludina*, p. 30, pl. 6, fig. 19; H. & T., C. I. pl. 37, fig. 7.

Testa anguste perforata, globoso-ovata, sericina, tenera, subpellucida, obsolete striata, subtilissime concentricè lineata, pallide ferruginea; spira obtusa; anfractibus 5 convexis, ultimo basi albo; apertura subovali, marginibus conjunctis, albo-callosis; peristomate reflexiusculo, basi angulato subauriculato. (*Küster.*)

Alt. 7·25, diam. 5·5 mm.

*Hab.* Purneah (Conch. Ind.).

**144. *Bithynia moreletiana*, Nevill.**

*Bithynia moreletiana*, Nevill, J. A. S. B. xlv, pt. 2, p. 29; op. cit., 1, pt. 2, p. 156, pl. 6, fig. 14.

*Original description*.—In shape resembling *B. lutea*, Gray (Conch. Ind. pl. 37, fig. 7); spire peculiarly short, apex very obtuse and flattened, always eroded, but not decollated; whorls

$3\frac{1}{2}$ , the last obliquely produced; always imperforate, both in very young and very old shells; margins of aperture entire, broadly reflected, produced and angled at base, outer margin rounded; epidermis dark olive-green; under the lens a minute spiral sculpture can be detected. Young specimens invariably show a sort of varix, formed probably at a period when their growth is arrested by some cause, this varix becoming absorbed in adult specimens.

Alt. 8 75, diam maj. 6; alt. anfract. ult. 7 mm.

Aperture: alt. 5 25, diam. 3 mm.

*Hab.* Yaylaymaw, ? Upper Burma.

"This species can easily be distinguished from the Indian *B. cerameopoma* and *B. lutea*; it is imperforate, has fewer whorls, a shorter and more obtuse spire, the columellar margin is less acutely angled at base, the epidermis green instead of brown."

The original dimensions given by Nevill are quoted below, though some of them are not intelligible.

"Long. max.  $8\frac{3}{4}$ , min.  $7\frac{1}{4}$ , diam. max. 6, min.  $7\frac{1}{4}$  mil., long. anfract. ult. 7; long. apert.  $5\frac{1}{4}$ , diam. 3 mil."

#### 145. *Bithynia pulchella* (Benson).

*Bithynia pulchella* (Benson), J. A. S. B. v, 1836, p. 746 (as *Pakudina*); H. & T., C. I. pl. 38, figs. 5, 6.

? = *Valveta*, no. 9, Hutton, J. A. S. B. iii, p. 90.

*Original description*:—Testa ovato-conica leviter striata, epidermide olivacea, anfractibus rotundatis, suturis depressis. Aperturæ peritremate nigrescente; umbilico arco.

Alt. 7·25 mm.

*Hab.* Sylhet (Conch. Ind.).

Nevill designates two new varieties in his 'Hand List of Mollusca in the Indian Museum,' p. 35, but without descriptions, as follows:—

Var. *obtusa*.

*Hab.* Port Canning (*Stolizka*).

Var. *pusilla*.

Presumably a stunted form.

Alt. 6·5, diam. 4·5 mm.

*Hab.* Ferozpur (*Temple*).

#### 146. *Bithynia subpulchella*, Nevill.

*Bithynia subpulchella*, Nevill, J. A. S. B. 1, pt. 2, p. 157, pl. 6, fig. 12.

*Original description*:—[Shell] narrowly rimate, conically ventricose, of rather thin substance, slightly transparent, without

sculpture, almost white, with a very slight brownish tinge here and there, suture very distinct, spire elongately drawn out, apex rather obtuse; whorls  $4\frac{1}{2}$ , convexly ventricose, the last one tumidly and globosely swollen, about the same size as the others together, a distinct opaque varix on the left-hand side (away from the aperture) on each side of the two last whorls; aperture nearly round, not oblique, with scarcely thickened, convex, peristome, and columellar margin nearly straight, subangulate at base.

Very variable in size. Type: Alt. 6, diam. 4 mm.

*Hab.* Kutch.

Type in Indian Museum, Calcutta.

A thinner form designated by Nevill, var. *tenuior*, also occurs in the same locality.

147. *Bithynia inconspicua*, Dohrn.

*Bithynia inconspicua*, Dohrn, P. Z. S. 1857, p. 123; H. & T., C. I. pl. 37, figs. 5, 6.

*Original description*:—Testa oblongo-conica, tenera, alba vel fulva, pellucida; spira acuta; anfractus 4–5 convexiusculi, sub lente leviter longitudinaliter striati; apertura oblonga. Operculum testaceum, concentricum.

Alt. 5, diam. 3.5 mm.

Aperture: alt. 2.5, diam. 1.75 mm.

*Hab.* Ceylon.

148. *Bithynia orcula*, Benson.

*Bithynia orcula*, Benson, MSS. in Frauenfeld, Verhandl. zool.-bot. Wien, 1862, p. 1154; H. & T., C. I. pl. 38, figs. 8, 9.

Shell very convex, globosely conic, scarcely perforate, milk-white, smooth though little polished; whorls 4, slightly rounded with the exception of the last which is considerably swollen; aperture large, roundly ovate; columellar margin somewhat reflexed; operculum weakly convolute, rather concave with central nucleus.

Alt. 6.4, diam. 5 mm.

*Hab.* Purneah (Con. Icon.).

Nevill in his 'Hand List,' pp. 36–37, cites several varieties without other descriptions than those contained in the names themselves; these are as below:—

**Var. minor.**

*Hab.* Orissa (*Ball*).

**Var. producta.**

*Hab.* Sambhar and Salt-Lakes (*Stoliczka*); Jamalpur (*Stoliczka*); Ferozpur (*Temple*).

The dimensions of the latter are:—Alt. 7, diam. 5.25 mm.

Var. *parvula*.

*Hab.* Moradabad; Jaunpur.

Var. *acuminata*.

*Hab.* Andamans? (*Roepstorff*).

149. *Bithynia nassa*, *Theobald*.

*Bithynia nassa*, Theobald, J. A. S. B. xxxiv, pt. 2, 1865, p. 275;  
op. cit., xxxix, pt. 2, p. 404, pl. 18, fig. 8; H. & T., C. I. pl. 37,  
figs. 8, 9.

*Original description*:—Testa elongata, turbinata, polita, diaphana, solidiuscula. Labio expansiusculo, plica callosa externa munita. Anfractibus quinque.

Alt. 10·25, diam. 6·25 mm.

*Hab.* Shan States.

A supplementary and fuller description is given in the Journ. Asiat. Soc. Bengal, vol. xxxix, as follows:—

Testa elongato turrata, polita, diaphana, solidiuscula, imperforata; anfractibus 6, lente convexis, sutura simplici junctis, striis exilissimis incrementi tectis; ultimo basi convexiusculo; spira brevior; apertura subovata, intus lævi, supra (vel postice) acute angulata, antice rotundata, sensim producta; labio et labro leviter curvatis, primo paulo incrassato, altero acuto, margine tenui, extra prope marginem costa solidiuscula crassa instructo; operculo testaceo, ovato, concentrice striato, nucleo subcentrali.

Alt. 8·5, diam. maj. 6·25 mm.

Aperture: alt. 4·75, diam. 3·25 mm.

*Hab.* Shan States.

150. *Bithynia lævis*, *Morelet*.

*Bithynia lævis*, Morelet, Ser. Conch. iv, 1875, p. 313, pl. 13, fig. 2  
(as *Bithynia lævis*); Nevill, Hand List, pt. 2, p. 38.

*Original description*:—Testa superficialiter arcuato-rimata, conico-oblonga, corneo-rubella vel lutescens, lineolis spadiceis, distantibus, longitudinaliter notata, nitida, lævis, apice truncatula; anfr. 5½ convexiusculi, sutura simplici juncti, ultimus ventriculosus, circa rimam compressus: apertura ovalis, basi angulata, intus albedo-cerulea, marginibus crassioribus, obtusiusculis, fusco anguste limbatis, columellari strictim dilatato. Operculum testaceum, pagina interna homogœnea, alba, externa concaviuscula, epidermide fulva, concentrice striata induta, nucleo subcentrali.

Alt. 10, diam. 5 mm.

Aperture: alt. 4·5 mm.

*Hab.* Siam, Cochin China (*Morelet*); Damotha, Moulmein (*Stoliczka & Richthofen*).

151. *Bithynia goniomphalos* (Morelet).

*Bithynia goniomphalos* (Morelet), Rev. et Mag. Zool. 1866, p. 167 (as *Paludina*); Ser. Conch. iii, pl. 13, fig. 4.

*Bithynia irawadica*, Blanford, P. Z. S. 1869, p. 446; H. & T., C. I. pl. 37, fig. 10 (as *Bythina irawadica*); Nevill, in J. Anderson's Anat. & Zool. Researches during Yunnan Exp., Calcutta, 1878 [1879], p. 890.

*Original description*:—Testa rimato-perforata, oblongo-conoidea, solidula, sub lente subtilissime decussata, parum nitens, viridifusca; spira elongato-conica, apice truncata, anfr. superst.  $4\frac{1}{2}$  convexi, ultimus circa perforationem compresso-carinatus, spiram non æquans; apertura ovalis, basi angulata, intus lilacina, marginibus fusco anguste limbatis. Operculum testaceum, extus concentricè lamelloso-striatum, intus candidum.

Alt. 14, diam. 7 mm.

*Hab.* Cochin China (Morelet); marshes and rivers round Mandalay (Blanford).

152. *Bithynia evezardi*, Blanford.

*Bithynia evezardi*, Blanford, J. A. S. B. xlix, pt. 2, p. 220; Nevill, op. cit. i, pt. 2, p. 157, pl. 6, fig. 13.

*Original description*:—Shell narrowly umbilicate, ovately conical, solid surrounded by regular spiral impressed lines rather close together, whitish horny, covered with an olive epidermis. Spire conical, apex eroded, suture deeply impressed. Whorls remaining 3 (in a perfect shell about 4 to 5), rounded, the last about half the whole length, moderately ventricose, angulately compressed at the base around the umbilicus, which is conical and smooth inside. Aperture nearly vertical, oval, subangulate in front at the base and at the posterior extremity; peristome simple, straight, obtuse; operculum normal.

Alt. 3.75, diam. maj. 3.25, diam. min. 2 mm.

Aperture: alt. 2, diam. 1.5 mm.

*Hab.* Lanowlee (Lanaoli), on the railway-line between Bombay and Poona, a few miles east of Khandalla at the top of the Bor-ghat.

153. *Bithynia pygmæa*, Preston.

*Bithynia pygmæa*, Preston, Rec. Ind. Mus., Calcutta, ii, p. 45, fig. in text.

*Original description*:—Shell ovately fusiform, dark olive-brown; whorls  $3\frac{1}{2}$ , convex, smooth; sutures well impressed; aperture oval; peristome simple, continuous; umbilicus narrow; operculum shelly, spiral with central nucleus.

Alt. 3.25, diam. maj. 2 mm.

Aperture: alt. 1.75, diam. 1 mm.

*Hab.* Myetmyo, Burma.

Type in Indian Museum, Calcutta.

154. *Bithynia stenothyroides*, Dohrn.

*Bithynia stenothyroides*, Dohrn, P. Z. S. 1857, p. 123; H. & T., C. 1. pl. 38, figs. 7, 10.

*Original description*:—Testa ovata, tenera, alba vel fulva, pellucida, nitida; anfractus 4–5 convexiusculi, ultimus effatus, ventricosus, ad basin leviter carinatus, antice descendens; sutura simplex; apertura oblongo-ovata, parum coarctata, ad basin acuta, alba. Operculum oblongo-ovatum, testaceum, crassum, concentricè striatum.

Alt. 5.5, diam. 4.75 mm.

Aperture: alt. 3, diam. 2 mm.

*Hab.* Ceylon; Nilgherries.

“This species has some characters of *Stenothyra*. The last whorl is unusually great, the mouth somewhat contracted, but the general aspect is that of *Bithynia*.”

Nevill gives the following variety as new, but without other description than the mere name (*Hand List Moll. in Ind. Mus.*, Calcutta, pt. 2, p. 37):—

Var. *biangulata*.

*Hab.* Madras.

155. *Bithynia troscheli* (Paasch).

*Bithynia troscheli* (Paasch), Archiv für Naturg., Berlin, 1842, p. 300, pl. 6, figs. A–D (as *Paludina*).

*Paludina similis*, Boll. Moll. Arch. Ver. Freunde Naturg., Mecklenburg, v, 1851, p. 102; Nevill, *Hand List*, pt. 2, p. 40.

Shell small, ovately fusiform; whorls 4–5, convex; suture rather deep; labrum continuous; aperture ovate.

Alt. 5.5, diam. 4.25 mm.

*Hab.* Europe; Kashmir.

“All the Kashmir specimens are decollate; the whorls are even more convexly rounded than usual.” (*Nevill*.)

Subgenus **FOSSARULUS**.

*Fossarulus*, Neumayr, Jahrb. Geol. Reichs. Anst., Wien, 1869, p. 361.

TYPE, *F. stachei*, Neumayr: Miocene of Dalmatia.

Range. India.



*Original description*:—Testa parva, subglobosa, rimata, longitudinaliter nodoso-costata; apertura late ovata, superne et ad basin effusa; peristomate continuo, incrassato, duplicato.

156. *Bithynia* (? *Fossarulus*) *costigera*, Kuster.

*Bithynia* (? *Fossarulus*) *costigera*, Kuster, Conch.-Cab., *Paludina*, p. 33, pl. 7, figs. 18, 19.

*Valvata sulcata*, Eydt. & Soul., Voy. 'Bonite,' Zool. p. 517, pl. 31, figs. 19–21; H. & T., C. I. pl. 151, fig. 10.

*Original description*:—Testa perforato-rimata, ovato-conica, turrita, solidula, pallide flava; spira acuta; anfractibus 6 convexis, subtiliter concentricè lineatis, longitudinaliter striatis, superne planulatis; superioribus lineis tribus, ultimo numerosis lineis elevatis, transversis obsitis; apertura subrotunda, peristomate recto, margine angulato.

Alt. 7·5, diam. 5·5 mm.

*Hab.* Bengal.

Var. *curta*, Nevill, Hand List, pt. 2, p. 42.

A short form, apparently constant, with the spire less produced or exserted.

Alt. 6·5, diam. 5·5 mm.

*Hab.* Bangalore.

Subgenus **HYDROBIOIDES**.

*Hydrobioides*, Nevill, Hand List, 1884, pt. 2, p. 42.

TYPE, *Bithynia*? *turrita*, Blanford; Burma.

*Range.* India; Burma.

Shell solid, turrite, rimate; aperture ovate; the margins of the peristome united by a parietal callus.

157. ? *Bithynia* (*Hydrobioides*) *turrita* (Blanford).

? *Bithynia* (*Hydrobioides*) *turrita* (Blanford), P. Z. S. 1869, p. 446 (as *Fairbankia* (an *Bithynia*)).

*Bithynia turrita*, Nevill, in J. Anderson's Anat. & Zool. Researches during Yunnan Exp., Calcutta, 1878 [1879], p. 890, pl. 80, figs. 4, 4 a.

*Original description*:—Testa subperforata, turrita, solidula, fulva, glabra, nitidula. Spira elongato-conica, sutura impressa. Anfr. 7, convexi, ultimus antice subascendens, subtus rotundatus. Apertura ovata, postice vix angulata, varice externa mediocri instructa; peristoma undique expansiusculum, marginibus callo junctis, externo leviter arcuato, columellari obliquo, antice cum basali subangulatim juncto. Operc.—?

Alt. 6·25, diam. 3 mm.

Aperture: alt. 2·5, diam. 1·75 mm.

*Hab.* Kyoukpong, River Irawady.

### Subfamily STENOTHYRINÆ.

Foot simple; radula of *Bithynia*; operculum calcareous, spiral.

*Distribution.* S. and E. Asia; N. Australia (Recent): Eocene of Europe (Fossil).

### Genus STENOTHYRA.

*Stenothyra*, Benson, A. M. N. H. ser. 2, xvii, 1856, p. 496.

*Nematura*, Benson, J. A. S. B. v, 1836, p. 781 (not of Fischer, genus *Orthopt.*, 1813).

TYPE, *S. deltæ*, Benson; Gangetic Delta.

Range. S. & E. Asia; N.E. Australia.

*Original description.*—*Animal.* Caput tentaculis duobus setaceis oculis postice prope bases tentaculorum sessilibus; proboscide elongata, cylindracea, extensili. Pes ovato-oblongus, medio ventricosus, postice angustatus, acuminatus, processu brevi filiformi subito desinens; antice expansus, medio profunde emarginatus; ala utroque latere porrecta late angustata, acuminata.

Testa ovata, ventricosa, a latere compressa, ultimo anfractu insuper aperturam angulato, deflexo. Apertura integra constricta, orbiculari, supra vix angulata; peritremate acuto leviter intus incrassato. Operculo tenui in spiram plenam convoluto.

#### 158. *Stenothyra deltæ* (Benson).

*Stenothyra deltæ* (Benson), J. A. S. B. v, 1836, p. 781 (as *Nematura*); A. M. N. H. ser. 2, xvii, 1856, p. 499; Sowerby, Mag. Nat. Hist. (Charlesworth's series) i, 1837 (as *Nematura*); H. & T., C. I. pl. 37, fig. 2.

*Original description.*—Testa ovato-conica, a lateribus tumida, lutescente, ultimo anfractu ventricosus, majori omnibus oblique minute striatis; spira brevi, apice acuto; umbilico evanescente.

Alt. 6 mm.

*Hab.* Ganges Delta.

Subvar. *minor*, Nevill, Hand List, pt. 2, p. 43.

Alt. 4, diam. 2·5 mm.

*Hab.* Port Canning (Nevill, Wood-Mason).

Subvar. *minima*, Nevill, tom. cit.

Alt. 2·75, diam. 1·75 mm.

*Hab.* Port Canning (Nevill, Wood-Mason).

159. *Stenothyra hungerfordiana*, Nevill.

*Stenothyra hungerfordiana*, Nevill, J. A. S. B. xlix, pt. 2, p. 159;  
op. cit., l, pt. 2, p. 156, pl. 7, fig. 9.

*Original description*.—Testa parva, imperforata, ovato-elongata, solidiuscula, viridula, vix nitida (sub lente), lineis impressis ac dense puncticulatis confertim cingulata; spira panlulum elongata, ovato-convexa, apice obtuso, sutura profunda ac obsoleta marginata; anfr. 4, convexi, ultimus compresse ovuliformis, antice subapplanatus, valde descendens; apertura perpusilla, suboblique rotundato-ovata, superne leviter angulata, sulco profundiori ab anfractu ventrali separata, peristomate obtuso.

Alt. 2.5, diam. 1.5 mm.

*Hab.* Andaman Islands.

"This is one of the most distinct and interesting species of the genus as yet discovered; the few imperforate whorls, with markedly obtuse apex; the distinct, though minute, close punctulation; the unusually convex whorls, with the remarkable long, compressed, slightly flattened, and egg-shaped last whorl are all good characters. The suture is very distinct and, on the last whorl, distinctly marginate below. The operculum is normal."

Type in Indian Museum, Calcutta.

160. *Stenothyra monilifera*, Benson.

*Stenothyra monilifera*, Benson, A. M. N. H. ser. 2, xvii, 1856,  
p. 497; Blanford, Cont. Ind. Mal. pt. 8, pl. 2, fig. 15; H. & T.,  
C. I. pl. 37, fig. 4 (as *Nematura* in Index).

*Original description*.—Testa subperforato-rimata, oblongo-ovata, compressiuscula, nitidiuscula, sulcis confertioribus, dense puncticulatis, spiralibus impressa, fusco-cornea, fascia pallida supra mediam ornata, versus apicem obtusulum hyalinum rubente, spira convexo-conica, sutura profunda, canaliculata; anfractibus  $4\frac{1}{2}$  convexis, ultimo subsoluto,  $\frac{3}{4}$  testæ æquante, antice valde descendente, subtus rotundato, periomphalo subcompresso; apertura obliqua diagonali, rotundato-ovali, sules profundiori ab anfractu penultimo divisa, peristomate obtusulo, callo parietali superne solum conspicuo. Operculo corneo-pellucido, apice ad dextram spectante.

Alt. 4.5, diam. 3 mm.

*Hab.* Mergui; Pegu.

161. *Stenothyra foveolata*, Benson.

*Stenothyra foveolata*, Benson, A. M. N. H. ser. 2, xvii, 1856,  
p. 497; H. & T., C. I. pl. 37, fig. 3 (as *Nematura* in Index).

*Original description*.—Testa vix rimata, ovato-acuta, spiraliter foveolato-striata, striis versus basin confertissimis, spira conica, apice acuto, sutura mediocri; anfractibus 5 convexusculis, ultimo at ventrem planiusculo,  $\frac{1}{2}$  testæ æquante, antice descendente, basi

rotundato; apertura obliqua. rotundato-ovata, peristomate obtuso, margine parietali sulco mediocri ab anfractu ventrali separato. Operculo — ?

Alt. 5, diam. 3.25 mm.

Hab. Ganges, near Sikrigali, Bengal.

Nevill cites a var. *minor* (Hand List, p. 44) also from Sikrigali.

162. *Stenothyra blanfordiana*, Nevill.

*Stenothyra blanfordiana*, Nevill, J. A. S. B. xlix, pt. 2, p. 160; op. cit., 1, pt. 2, p. 156, pl. 7, fig. 10.

*Original description*:—Testa minima, superficie rimata, sub-ventricosus-ovata, vix solidiuscula, nitida, lævis, pallide cornea, subpellucida; spira subacuta, apice minuto, subobtusum; anfr.  $4\frac{1}{2}$ , convexi, ultimus magnus, subsolutus, tumide-ventricosus, subbiangulatus, antice subapplanatus; apertura subovalis, paululum postice retrorsa, peristomate continuo, superne angulato. Operculum ovale, superne leviter acuminatum, vix crassiusculum, subtranslucidum, spirale, apice subcentrali, interne testaceo-costatum.

Alt. 3.1, diam. 2.1 mm.

Hab. Lake Chilka (type); also Port Canning and Madras.

Of the operculum the author further states: "it is oval, semi-transparent, spiral, of few whorls, with the apex also central, on the inner side three ridges, one semicircular and two short ones with a slight S-curvature, for the attachment of the animal.

"The species is somewhat variable, especially as regards size and the greater or less distinctness of the angulation of the last whorl. Specimens from Port Canning agree better with the above-described typical form than do those from Madras."

The type is in the Indian Museum, Calcutta.

163. *Stenothyra minima* (Sowerby).

*Stenothyra minima* (Sowerby), in Mag. Nat. Hist. (Charlesworth's series), i, 1837, p. 217, fig. 22b (as *Nematura*); Adams, P. Z. S. 1851, p. 225 (as *Nematura*); Benson, A. M. N. H. ser. 2, xvii, 1856, p. 501; H. & T., C. I. pl. 37, fig. 1.

*Original description*:—Testa parva, cornea, semipellucida, ovali, spira subproducta; polita, fasciis rufis subobsoletis ornata; apertura orbiculari, peritremate simplici.

Alt. 3 mm.

Hab. Western India; Lake Chilka.

164. *Stenothyra woodmasoniana*, Nevill.

*Stenothyra woodmasoniana*, Nevill, J. A. S. B. xlix, pt. 2, p. 159; op. cit., 1, pt. 2, p. 156, pl. 7, fig. 8.

*Original description*:—Testa parva, imperforata, ovato-acuta,

solida, crassa, pallide viridula, polita, nitida (sub lente), obsolete submalleata; spira aculeiformis, subconcava, producta, apice per-acutissimo; anfr. 6, haud convexi, ultimus pertumidus, medio subangulatus, basi applanatus, antice ad aperturam abrupte et valide deflectus; apertura percontracta, perfecte rotundata, marginibus continuis, valide incrassatis.

Alt. 3·5, diam. 2 mm.

*Hab.* Port Canning.

"This interesting form is easily recognized by the very acute and concavely-excavated spire, the subangulate last whorl, flattened round the umbilical region; it is not spirally pitted, as in most species of the genus, but appears absolutely malleated or indented under a powerful lens."

The type is in the Indian Museum, Calcutta.

165. *Stenothyra chilkaensis*, *Preston*.

*Stenothyra chilkaensis*, Preston, Rec. Ind. Mus., Calcutta, x, 1914, p. 300, fig. on p. 298.

Shell minutely rimate, ovate, yellowish brown; whorls 5, the first very small, the second large in proportion, the last also large, convex, without sculpture; suture well impressed; perforation reduced to a very narrow chink; labrum continuous; aperture oblique, ovate.

Alt. 2·75, diam. maj. 2 (nearly), diam. min. 1·5 mm.

*Hab.* Barkul, Lake Chilka, Orissa, among weeds at the edge of the lake.

Type in the Indian Museum, Calcutta.

166. *Stenothyra orissaënsis*, *Preston*.

*Stenothyra orissaënsis*, Preston, tom. cit.

Shell small, narrowly perforate, ovately turbinate, pale greenish yellow; whorls 5, regularly increasing, smooth, but for growth markings, the last convex and rapidly descending in front; labrum continuous, slightly erect; aperture strangulate, oblique, oval.

Alt. 2·25, diam. maj., 1·5 mm.

*Hab.* Off Satpara, Lake Chilka, Orissa, at a depth of from 4 to 6 feet, close in shore (type); dead specimens were also taken at Manikpatna at a depth of 4 feet.

Type in Indian Museum, Calcutta.

## Family VIVIPARIDÆ.

## Subfamily VIVIPARINÆ.

Shell turbinate, subperforate or imperforate; whorls more or less convex; operculum horny, concentric with excentric sublateral nucleus placed near the inner margin.

*Distribution.* Europe, Asia, Africa, Australia, and N. America.

## Genus VIVIPARA.

*Vivipara*, de Montfort, Conch. Syst. ii, 1810, p. 247, as *Viviparus*, emend. Dupuy, Hist. nat. des Moll. . . qui vivent en France, 1851, p. 534.

*Paludina*, auct.

TYPE, *V. fluviatorum*, de Montf. (*vivipara*, Linn.); Europe.

*Range.* Europe; Asia; Africa; Australia; N. America.

Shell conoidal, rather thin, with obtuse apex; whorls convex; labrum not sinuous; operculum horny with sublateral nucleus.

Animal having the foot moderately large; tentacles long; right cervical lobe very large and bent back to form a groove; teeth of the radula finely crenellated on their reflexed margin.

167. *Vivipara bengalensis* (Lamarck).

*Vivipara bengalensis* (Lamarck), Anim. s. Vert. (ed. Desh.), viii, p. 513; Deles. Rec. Coq., Lam. pl. 31, fig. 2 (as *Paludina*), Reeve, Con. Icon, *Paludina*, sp. 5; Kuster, ed. Chemn., *Paludina*, figs. 15, 16.

*Paludina elongata*, Swains. Zool. Ill. ser. 1, pl. 98, top

*Paludina lineata*, Valenc. in Humb. & Bonpl. Voy., Zool. ii, p. 255; H. & T., C. I. pl. 76, figs. 8, 9, 10.

*Original description*:—Testa ventricosa, ovato-acuta, tenui, virescente, transversim fusco-lineata; striis exilissimis decussatis; spira conica; anfractibus septenis, convexis.

To supplement the above, Reeve's description is given below.

Shell elevatedly conical, thin, greenish, shining lineated and narrowly banded with dark-green; whorls convex, smooth, very minutely decussately striated.

Alt. 38, diam. 24 mm. (fig. 5 *a* in Conch. Icon.).

Alt. 44, diam. 29.5 mm. (fig. 5 *b* in Conch. Icon.).

*Hab.* North-West Provinces of Hindostan.

A shining pale-green shell, banded and lineated throughout with dark green, sometimes turning to rusty-brown. The surface is very minutely engraved with impressed spiral striæ, decussating slightly-raised longitudinal striæ, which are striæ of growth.

Var. *balteata* (Benson), J. A. S. B. 1836, pt. 2, p. 745; Nevill, Hand List, pt. 2, p. 21.

*Hab.* Sulchar, etc.; Cachar.

Var. *fasciis-elevatusculis*.

*Hab.* Sylhet (*Benson*); Silchar and Cachar (*Wood-Mason*).

Var. *phaeostoma* (*Nevill*), Hand List, pt. 2, p. 21 (without description).

Presumably a dark-lipped form.

*Hab.* Calcutta.

Var. *gigantea* (*Reeve*), van den Busch, MS., in Reeve, Con. Icon. sp. 7 (as *Paludina gigantea*); Nevill, Hand List, pt. 2, p. 21.

*Original description*:—Shell elevately conical, rather ventricose, pale green, more or less obscurely banded and lineated with dark green, whorls obtusely swollen round the upper part, then rounded, decussately very minutely striated, longitudinal striæ numerous, close-set.

Alt. 54, diam. 37.5 mm. (fig. in Con. Icon.).

*Hab.* Bengal (*Reeve*); Dinápur (*Mainwaring*).

#### 168. *Vivipara doliaris* (*Gould*).

*Vivipara doliaris* (*Gould*), Proc. Bost. Soc. Nat. Hist. i, p. 144 (as *Paludina*); Otia Conch. p. 191; Reeve, Con. Icon., *Paludina*, sp. 1; H. & T., C. I. pl. 77, fig. 6.

*Original description*:—Testa tenui conico-globosa, luteo-viridescente, arctissime umbilicata; anfract. 5 ventricosis. striis minutissimis reticulatis, costulis numerosis inequalibus, purpureis, cinctis; apertura sub-circulari; columella reflexa, non appressa, alba; labiis postice disjunctis.

Alt. 28, diam. 22.5 mm.

*Hab.* British Burma (Conch. Ind.).

#### 169. *Vivipara oxytropis* (*Benson*).

*Vivipara oxytropis* (*Benson*), J. A. S. B. v, 1836, p. 745 (as *Paludina*); Reeve, Con. Icon., *Paludina*, sp. 9.

*Paludina pyramidata*, Philippi, Ab. N. Conch. i, *Paludina*, pl. 1, figs. 3, 4; Kuster, ed. Chemn., *Faludina*, pl. 6, figs. 1, 2; H. & T., C. I. pl. 76, fig. 5.

*Original description*:—Testa tenui ovato-conica olivacea, decussatim striata; anfractibus superne carinis plurimis fuscis ornatis, ultimi carina media saliente subacuta; inferne fasciis quibusdam elevatusculis fuscis; suturis inconspicuis; apice acuta; canali umbilicali excavato; apertura intus violacea, peristomate acuto, nigro.

Alt. 42, diam. 32.5 mm.

*Hab.* Bengal.

170. *Vivipara naticoides* (*Theobald*).

*Vivipara naticoides* (*Theobald*), J. A. S. B. xxxiv, 1865, pt. 2, p. 274, pl. 9, figs. 1, 2, 3 (as *Paludina naticoides*); H. & T., C. I. pl. 76, figs. 1, 4.

*Original description*:—Testa turbinata, sub-polita, solida, pallide flavescente cornea ad peripheriam carina munita; marginibus callo junctis, callo columellari non raro valde incrassato, umbilicum obtegente.

Alt. 33, diam. 22 mm. (taken from fig. 1 in *Conch. Ind.*).

Alt. 34.5, diam. 24 mm. (taken from fig. 4 in *Conch. Ind.*).

*Hab.* Shan States.

*Var. concolor* (*Nevill*), *Hand List*, pt. 2, p. 25.

Of a light, uniform, olive-green colour; whorls not so exserted as usual, last one less swollen in proportion, more regularly and globosely swollen, with a single, somewhat inconspicuous, raised ridge at the periphery; aperture small, with the outer margin regularly rounded.

Alt. 25.75, diam. 18 mm.

*Hab.* Upper Salween (type) (*Theobald*).

*Var. carinata* (*Theobald*), *tom. cit.* p. 275.

*Original description*:—*Var. carinata*. Carinis quatuor fortissimis supra munitur, et infra peripheriam sex vel quinque lævioribus; colore albido; epidermide flavescente, fasciis nonnullis castaneis interdum ornata.

Alt. 35, diam. 25 mm.

*Hab.* Shan States.

"These two varieties pass into each other, but the peculiar columellar callus is pretty constant in all specimens. But for this character, some of the smooth variety might be referred to *P. bengalensis*, which is an extremely variable species.

"The strongly corded var. is well marked, but I have preferred taking the smooth shell as the type of the species, and have regarded the keeled individuals as hypertrophied, placing the greatest value, as a specific character, on the columellar callus, occurring in both varieties."

*Var. fasciata* (*Theobald*), *tom. cit. & Cat. Moll.*, Fasc. E, p. 34.

*Original description*:—*Varietas fasciata*, fasciis duabus castaneis ornatur, hac superperipheralis, illa juxta suturam posita. Anfractu ultimo tertia notest a carina paulum remota. Callo flavescente, ore interiori cœrulescente. Anfractibus  $6\frac{1}{2}$ .

Alt. 36, diam. 27.5 mm.

*Hab.* Shan States.



171. *Vivipara theobaldi*, Kobelt.

*Vivipara theobaldi*, Kobelt, in Martini & Chemnitz, Conch.-Cab. 1907, p. 151, pl. 30, figs. 10, 11.

*Original description*.—Testa exumbilicata, ovato-conica, tenuis, haud nitens, unicolor fusco-olivacea vel subnigrans, subtiliter striatula, plerumque limbo ferrugineo adhærente induta, apice nigricante. Spira conica, apice acuto, sutura parum impressa. Anfractus 7, superi convexi, inferi supra planati et angulati, carnis spiralibus plus minusve distinctis 3 cincti, ultimus acute carinatus, carina versus aperturam distinctiore et subtuberculata, utrinque convexus, carinulis tribus superioribus, prima et secunda magis approximatis, duabus inferis minoribus cinctus, antice descendens, basi irregulariter costato-sulcatus, spiræ altitudinem superans. Apertura parum obliqua, basi recedens, ovata, supra acutiuscula, faucibus cœrulescentibus, vix fasciatis; peristoma callo angusta nigro-marginato continuum, margine externo vix incrassato, extus ad carinam angulato, columellari calloso, distincte duplici sed parum incrassato, albo, nigro-marginato.

Alt. 31.5, diam. 24 mm.

Aperture: alt. 17; diam. 12 mm.

Hab. Burma (*Moellendorff Coll.*).

172. *Vivipara crassa* (Hutton).

*Vivipara crassa* (Hutton), MSS in Benson, J. A. S. B. v, 1836, p. 745 (as *Paludina*); Reeve, Con. Icon, *Paludina*, sp. 33.

*Paludina obtusa*, Troschel, Wiegmann's Arch. Nat. Hist. 1837, p. 173; Philippi, N. Conch. i, p. 116, pl. I, fig. 14; Reeve, Con. Icon., *Paludina*, fig. 33; H. & T., C. I. pl. 76, figs. 2, 3.

*Original description*.—Testa ovato-conoidea, ventricosa, solida, pallide virente, obsolete fasciata, rugis exilissimis decussata; anfractibus tumidis, suturis excavatis; spira obtusa; umbilico subcanaliculato; apertura intus lactescente.

Alt. 25 mm.

Hab. Bengal.

"This species varies in configuration even in the same waters, some specimens approaching to a subglobose form, while others have a more lengthened conoid spire. It is very abundant in the river Gúmtí at Jonpur, where it is paler, and has a more yellowish tinge than the Silhet variety, which, from having an eroded summit, appears to have inhabited stagnant water. It has a singular habit, for the genus, of burying itself in the mud or sand in shallow water, often in large societies; other species conceal themselves in the mud in the season of drought, but *P. crassa* does so from choice, and is impelled by no such necessity. The shell of the lately excluded young is so depressed and globular, that it might be easily mistaken for a young *Ampullaria*. The adult shell attains a degree of thickness unusual in the genus."

Var. *tezpurensis* (Nevill), Cat. Moll., Fasc. E, p. 35.

"A very interesting form, almost exactly intermediate between *P. crassa* and *P. siamensis*. Spire much shorter than in typical form, and only a little more produced than in the Siam species; whorls more globose; aperture less deflected, umbilicus less open, sculpture more distinctly malleated. . . ."

Alt. 17·5, diam. 15·5 mm.

Aperture: alt. 9·5, diam. 11·5 mm.

Hab. Tezpur.

### 173. *Vivipara siamensis* (Frauenfeld).

*Vivipara siamensis* (Frauenfeld), Verh. zool.-bot. Ges. Wien, 1865, p. 531, pl. 22; Nevill, J. A. S. B. xlv, pt. 2, p. 32, & op cit. 1, p. 32.

Shell solid, acuminate conic, flattened below, widely perforate, somewhat polished, very pale olive-green, margins of the upper whorls almost whitish, the third and fourth convolutions tinged with purplish-brown; whorls 5, very convex, though somewhat flattened in the sutural region, marked with faint growth lines which show darkly here and there and sculptured with weak, interrupted, spiral striæ; aperture large, broad; labrum thick, black; interior of shell white; operculum thin, pale brownish, with very excentric nucleus.

Alt. 24, diam. 21 mm.

Aperture: alt. (including the labrum) 17·5, diam. 14·5 mm.

Hab. Siam.

Var. *burmanica* (Nevill), Hand List, pt. 2, p. 26.

*Original description*:—A very small variety; spire short, apex obtuse, with the whorls even less acute and exserted, the last one larger in proportion and more globosely swollen, with the keel round the umbilicus obsolete; aperture more contracted, that is, less dilately expanded; colouration of epidermis and the black peristome exactly similar.

Alt. 11, diam. 10 mm.

Hab. Prome, on the Irawady (type) (*Theobald*); Tenasserim Province (*Limborg*); Yaylaymaw, Upper Burma (*Anderson*).

### 174. *Vivipara dissimilis* (Müller).

*Vivipara dissimilis* (Müller), Verm. pt. 2, p. 184 (as *Nerita*); Schröter, Einleit. Conch ii, p. 253, pl. 4, fig. 10 (*Nerita*).

*Helix dissimilis*, Gmelin, Syst. Nat. 3647; Dillwyn, Desc. Cat. p. 941 (*Nerita*).

*Paludina remossii*, Küster (not Philippi), ed. Chemn., *Paludina*, p. 26, pl. 5, figs. 17, 18; H. & T., C. I. pl. 77, figs. 3, 4.

*Original description*:—Testa pellucida glabra fuscescente-alba; albido maxime in inferiore anfractus parte conspicitur, quasi

fascia lata alba cincta esset. Anfractus sex convexitate inter *viviparam* et *fasciatam* media. Apertura distinguitur margine minus acuto, nigro, nitido. Operculum pellucidum luteo-fuscum, nitidum.

Alt. 28, diam. 20 mm. (from fig. 3, pl. 77 in Conch. Ind.).

*Hab.* Tanks, near Calcutta; Kondooruware, etc. (Conch. Ind.).

Var. *sindica* (Nevill), Hand List, pt. 2, p. 28.

" . . . not decollate, 6 whorls, almost colourless."

Alt. 32, diam. 21·75 mm.

*Hab.* Sind; Kathiawar (Fedden).

Var. *subumbilicata* (Nevill), tom. cit.

Columella straighter than usual, only slightly edged with black; distinctly openly rimate, almost umbilicate; slightly more convex whorls, the last one almost perfectly rounded; belt at periphery less distinct than in typical form, substance of shell a trifle thicker and less brightly coloured.

*Hab.* Ferozpur (Temple).

Var. *assamensis* (Nevill), tom. cit.

*Original description* :—This is a well marked and characteristic variety, easily distinguished from all the preceding forms by the turreted and remarkably produced spire, the cylindrical instead of convex whorls; the deep, uniform green colour, the last whorl and aperture much smaller and more contracted in proportion, the latter less everted; periphery subangulate, with the belt obsolete; scarcely rimate; peristome black.

Alt. 22·75, diam. 16 mm.; slightly decollate.

*Hab.* Tezapore, etc., Assam (type) (*Stoliczka, Oulham*); Jamalpur? (*Stoliczka*); Silcuri, Cachar (*Wood-Mason*).

Var. *bhamoensis* (Nevill), tom. cit. p. 29.

" An interesting small form of the preceding, with shorter and less produced spire . . . ."

Alt. 17·25, diam. 13·75 mm.; slightly decollate.

Var. *kutchensis* (Nevill), Cat. Moll., Fasc. E, p. 40 (sine nom.); Hand List, pt. 2, p. 30 (as *Paludina*); Kobelt, in Martini & Chemnitz, Conch.-Cab. 1908, p. 287, pl. 58, figs. 1-4.

*Original description* :—A very fine, interesting form, with sculpture even more developed than in Madras specimens; no trace of a white band; sharply angulate in young specimens, becoming more or less obsolete in adult ones, no trace of biangulation; imperforate.

Alt. 28, diam. 22 mm.

*Hab.* Kach [Cutch] (*Stoliczka*).

175. *Vivipara variata* (Frauenfeld).

*Vivipara variata* (Frauenfeld), Verhandl. zool.-bot., Ges. Wien, 1862, p. 1163 (as *Paludina*); H. & T., C. I. pl. 115, fig. 8.

Shell somewhat conic, narrowly deeply umbilicate; olive-green, slightly polished; whorls 5?, not very convex, the last descending behind the aperture, marked with weak growth lines and sculptured with regular, numerous, very fine, punctate, spiral striæ; suture well impressed; aperture pyriform; interior of shell of a dirty bluish colour; labrum polished, black.

Alt. 21, diam. 16 mm.

Aperture: alt. 12, diam. 10 mm.

Hab. Pondicherry.

Var. *pseudohelicina*, Kobelt, in Martini & Chemnitz, Conch.-Cab. 1908, p. 293, pl. 59, figs. 5-8.

*Vivipara dissimilis* subsp. *heliciformis*, Nevill, Hand List, pt. 2, p. 30 (nec Frauenfeld).

*Original description*:—Testa subobtecte rimata, ovata, solida, subtiliter striatula, sculptura spirali nulla, olivaceo-viridis; spira erosa, sutura linearis. Anfractus, superst. 4-5 convexi, inferi supra subangulati, ultimus ad peripheriam obsolete angulatus, basi convexus, antice haud descendens. Apertura vix obliqua, sat anguste ovata, supra leviter acuminata, intus cœruleo-albida, late, nigro-limbata; margo columellaris leviter incrassatus.

Alt. 20, diam. 17 mm.

Aperture: alt. 11, diam. 9 mm.

Hab. Pegu.

Var. *peguensis*, Kobelt, in Martini & Chemnitz, Conch.-Cab. 1909, p. 378, pl. 58, figs. 7, 8.

*Original description*:—Testa anguste et subobtecte umbilicata, ovato-globosa, spira breviter conica, erosa, saturate viridescens-fusca, hic illic anguste nigro strigata, anfractibus convexis, sutura profunda discretis, ultimus magnus, obsoletissime angulatus, circa umbilicum subcompressus; peristoma late nigrolimbatus. Operculum crassiusculum, extus limbo incrassata, intus disco pedali prominente munitum.

Alt. 21, diam. 17 mm.

Aperture: alt. 12, diam. 10 mm.

Hab. Moulmein, Pegu.

176. *Vivipara ceylonica* (Dohrn).

*Vivipara ceylonica* (Dohrn), P. Z. S. 1857, p. 123 (as *Paludina*); Reeve, Con. Icon., *Paludina*, sp. 32 (as *P. ceylanica*); H. & T., C. I. pl. 77, figs. 1, 2, *P. ceylanica*.

*Original description*:—Testa ovato-conica, perforata, solidiuscula,

viridis, versus apicem fuscescens; spira magis minusve elevata, exserta; anfractibus convexi, ad suturam et basin obsolete, medio acute carinati; spiraliter et longitudinaliter striata; sutura simplex, impressa; apertura ovata, intus alba, peristoma subincrassatum, reflexiusculum, nigrum.

Alt. 21, diam. 16 mm.

Aperture: alt. 12·5, diam. 9 mm.

Hab. Ceylon.

Var. *ecarinata* (Hanley & Theobald), Conch. Ind. pl. 115, fig. 9.

The type of this variety is not available, and is probably lost; the figure depicts an ecarinate shell with rounded whorls and painted with a narrow, brownish or blackish, subperipheral band on the last whorl.

Alt. 21, diam. 16·5 mm.

Hab. Ceylon.

### 177. *Vivipara lecythis* (Benson).

*Vivipara lecythis* (Benson), J. A. S. B. v, 1836, p. 745 (as *Paludina*); H. & T., C. I. pl. 76, fig. 6.

*Original description*:—Testa tenui, globoso-conica ampullacea, olivacea, glabra, rugis obsolete decussata; spira obtusiuscula; anfractibus valde ventricosi, rotundatis; suturis excavatis; apertura intus violacea spiram longitudine superante; peritremate nigro, subreflexo; umbilico evanescente.

Alt. 50·5, diam. 42·25 mm.

Hab. Upper Burma (Conch. Ind.).

".... It is a very thin shell in proportion to its volume. The epidermis is greenish olive in young specimens, reddish fuscous in the adult."

### Var. *ampulliformis* (Benson).

*Paludina ampulliformis*, Eydoux & Souleyet, Voy. Bouite, Zool. p. 549, pl. 31, figs. 25-27; H. & T., C. I. pl. 76, fig. 7.

*Original description*:—Testa globosa, conico-depressa, fusconigricante; anfractibus senis, ventricosi; superioribus erosiusculis; apertura ovato-acuta, obliqua, intus fusca; peristomate continuo; umbilico angusto. Operculum corneum, ovatum, concentricè striatum.

Alt. 35, diam. 30 mm.

Hab. Upper Burma; Cochin China.

"Only differs from the type by the absence of the infra-sutural angle." (Hanley & Theobald.)

178. *Vivipara remossei* (Philippi).

*Vivipara remossei* (Philippi) (erroneously as of Benson), Abbild. N. Conch. ii, *Paludina*, p. 134, pl. 2, fig. 3; H. & T., C. I. pl. 77, figs. 8, 9.

*Original description*:—Testa anguste-perforata; ventricosa, solida, lævigata, corneo-virente; spira exserta, acutiuscula; anfr. senis parum convexis, superne haud angulatis, sutura parum impressa divisis, ultimo subangulato; apertura ovato-orbiculari, spiram non æquante, nigrolimbata; labio calloso.

Alt. 29·25, diam. 22 mm.

Aperture: alt. 13·25 mm.

*Hab.* Jounpore, Soobathur, etc. (Conch. Ind.).

179. *Vivipara digona* (Blanford).

*Vivipara digona* (Blanford), P. Z. S. 1869, p. 445 (as *Paludina*); H. & T., C. I. pl. 115, fig. 7.

*Original description*:—Testa *P. bengalensi* persimilis, sed decussatum striatula, anfractibus superioribus juxta suturam angulatis; ultimo biangulato, et supra et infra peripheriam, angulis singulis fasciis fuscis spiralibus congruentibus, zona tertia intermedia, alis basalibus, lineis angustioribus spiralibus interdum interjectis.

Alt. 23·5–32, diam. 17·5–23 mm.

Aperture: alt. 13–17·5, diam. 10·5–14·5 mm.

*Hab.* The Irawady about Ava, Bhamo, etc.

Appears, according to its author, to be intermediate between *V. bengalensis* (Lk.) and *V. oxytropis* (Bens.).

180. *Vivipara nagaënsis*, Preston.

*Vivipara nagaënsis*, Preston, Proc. Malac. Soc. xi, p. 20, fig. in text.

*Original description*:—Shell globosely turbinate, rimate, dark olive; whorls 5, regularly increasing, convex, painted with narrow, transverse stripes of reddish-brown, sculptured with fine, spiral and wavy, transverse striæ, suture well impressed; umbilicus reduced to a mere chink; labrum very slightly reflexed, black, the margins joined by a light blackish callus; columella descending in a slight curve; interior of shell bluish; operculum thin, laminiferous, with excentric, depressed nucleus.

Alt. 28, diam. maj. 22, min. 20 mm.

Aperture: alt. 15·5, diam. 11 mm.

*Hab.* Naga Hills.

181. *Vivipara hilmendensis*, Kobelt.

*Vivipara hilmendensis*, Kobelt, in Martini & Chemnitz, Conch.-Cab. 1908, p. 289, pl. 59, figs. 9–12.

*Original description*:—Testa oblecte umbilicata, ovato-conica

vel ovato-turrita, solidula sed parum crassa, nitida, subtiliter striatula, sculptura spirali inconspicua, albida, obsolete fusco fasciata, fascia lata in anfractibus superis, duabus latis in ultimo. Spira conica vel turrita, apice in speciminibus extantibus fracto, in embryonalibus acutissimo; sutura distincta sed vix impressa. Anfractus 7 (superstites plerumque 5) convexi vel subteretes, mediani infra suturam plus minusve planati, ultimus tumidus, rotundatus, vix descendens. Apertura ovato-rotundata, supra vix acuminata, intus fusciscenti-albida; peristoma album, tenue, acutum, marginibus callo tenui junctis, columellari leviter super umbilicum dilatato. Operculum intus disco pedali rugoso vix prominente munitum.

Alt. 24, diam. maj. 20 mm.

Aperture: alt 13, diam. 15.5 mm.

Alt. 27, diam. maj. 22.5 mm.

Aperture: alt. 13, diam. 12 mm.

*Hab.* Seistan.

## 182. *Vivipara annandalei*, Kobelt.

*Vivipara annandalei*, Kobelt, in Martini & Chemnitz, Conch.-Cab. 1908, p. 296, pl. 57, figs. 11, 12 (*V. annendalei* [sic]).

*Original description*:—Testa vix rimata, ovata, tenuis, subtiliter striatula, sculptura spirali nulla, viridifusca, saturate fusco varie fasciata. Spira late conica, sat brevis, apice acutissimo; sutura linearis, impressa. Anfractus 6 vix celeriter accrescentes, superi convexiusculi, penultimus convexus, supra angulato-planatus, bifasciatus ultimus tumidus inflatus, supra vix planatus, medio obsolete angulatus, basi convexus, fasciis 4-6 lineolisque nonnullis angustis ornatus, antice haud descendens. Apertura magna, irregulariter ovata, supra angulata, faucibus livide cœrulescentibus fascis externis vix translucentibus; peristoma acutum, tenue, marginibus vix callo tenuissimo junctis, externo supra producto, basi cum columellari leviter dilatato et umbilicum fere obtegente angulum parum distinctum formante.

Alt. 26.6, diam. maj. 21 mm.

Aperture: alt. 16, diam. 11.5 mm.

*Hab.* South India?

Var. *halophila*, Kobelt, tom. cit. p. 297, pl. 59, figs. 17-20 (as *V. annandalei halophila* [sic]).

*Original description*:—Testa rimato-perforata, ovato-globosa, summo omnino cariose-erosa, tenuis sed solidula, parum nitens, striatula, sub vitro fortiore vix subtilissime spiraliter sculpta, viridi-fusca, fasciis nigro-castaneis 4-5 cincta. Spira in speciminibus adultis erosa, in junioribus breviter conica apice acuto; sutura linearis. Anfractus 6 (persistentes 3-4), penultimus angulato-tabulatus, ultimus inflatus, ad peripheriam obsolete angulatus, fasciis tribus majoribus, 2-3 linearibus cinctus, antice

haud descendens. Apertura magna, ovata, supra acuminata, infra subeffusa, faucibus cœrulescentibus; peristoma tenue, acutum, marginibus vix junctis, columellari vix dilatato. Operculum magnum, tenue, corneum, extus concavum, disco pedali haud rugoso.

Alt. 24, diam. maj. 20 mm.

Aperture: alt. 13, diam. 11 mm.

Hab. Salt Range (N. India).

183. *Vivipara shanensis*, Theobald.

*Vivipara shanensis*, Theobald, Catalogue, 1876, p. 17; Kobelt, in Martini & Chemnitz, Conch.-Cab. 1909, p. 411, pl. 77, figs. 4, 5.

*Original description*:—Testa exumbilicata, ovato-conica, solida, crassa, oblique striata, in anfractibus inferis spiraliter et peculiariter costata, costis nodosis, nitida, virescenti-fusca, subunicolor vel subnigro trifasciata. Spira elata, apice acuto, nigro; sutura distincta, inter anfractus inferos subirregularis, impressa. Anfractus 7, superi 3 lentissime accrescentes, læves, conulum regularum formantes, superi subscalati, liris spiralibus rudibus tribus primum lævibus, dein tuberculatis, sculpti; ultimus postice fere  $\frac{2}{3}$  altitudinis æquans, liris tuberculiferis vel seriebus tuberculorum obliquis 4-5 majoribus nonnullisque minoribus cinctus, serie quarta peripherica peculiariter squamosa, aperturam versus supra subdeclivis, subangulatus, ad angulum productus, vix descendens. Apertura irregulariter ovalis, supra acuminata, basi valde recedens, intus concolor vel fasciata; peristoma callo anguste nigro-marginato continuum, margine externo tenui, acuto, ad peripheriam subangulato, margine columellari calloso; dilatato, fusco, nigro-marginato, processum semilunarem, umbilicum omnino occludeatam emittente.

Alt. 30, diam. maj. 24 mm.

Aperture: alt. 18, diam. 14-15 mm.

Hab. Shan States.

Section IDIOPOMA.

*Idiopoma*, Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, liii, 1901, p. 189.

TYPE, *V. (I.) henriadensis*, Pilsbry; Burma.

Range. C. Africa: S.E. Asia.

This section is based upon the characters of the operculum as given in the following description of *V. (I.) henriadensis*, Pilsbry.

184. *Vivipara (Idiopoma) henriadensis*, Pilsbry.

*Vivipara (Idiopoma) henriadensis*, Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, liii, 1901, p. 188, pl. 5, fig. 1.

*Original description*:—Shell umbilicate, broadly ovate-conic;



olive-green with some narrow slightly darker streaks; surface glossy and smooth, under a lens showing fine, delicate and spaced spiral striæ, which become crowded and somewhat granulose on the base. Spire short, obtuse, the earlier whorls eroded, the eroded portion reddish, tipped with black. Sutures deeply impressed, the whorls strongly swollen just below them; last whorl angular at the periphery in front, the angle disappearing on the last half whorl, which is rounded; umbilicus narrow, excavated behind the columellar lip, surrounded by an angle. Aperture oblique, rounded-ovate, bluish white inside; peristome narrowly expanded at the edge, blunt, black, with a blackish border inside and out; continuous across the parietal margin. Operculum chestnut-brown and slightly wrinkled outside, with a conspicuous raised or reflexed cuticular border; inside with a conspicuously raised and minutely roughened ovate area nearer the columellar side, radiating striæ on the outside of this area, and a raised border all around.

Alt. 23, diam. 16.5-17.5 mm.

*Hab.* Henzada, Burma (*Winkley*).

185. *Vivipara* (*Idiopoma*) *heliciformis* (*Frauenfeld*).

*Vivipara* (*Idiopoma*) *heliciformis* (Frauenfeld) (as *Paludina*),  
Verhandl. zool.-bot. Ges. Wien, xv, 1865, p. 532, pl. 22; Zool.  
Misc. pt. 5

*Paludina dissimilis*, var. *decussatula* or *P. decussatula*, Blanford,  
P. Z. S. 1869, p. 445; H. & T., C. I. pl. 77, figs. 6, 10.

Shell acuminate conic, scarcely umbilicate, rather solid, smooth, polished, pale olive-green with eight or nine more or less conspicuous brownish bands which disappear entirely on the upper whorls; whorls 6, regularly increasing, convex; suture well impressed; aperture oval, somewhat angled above; interior of shell bluish white; peristome acute, erect, somewhat thickened towards the columella.

Alt. 20.5, diam. 14.5 mm.

Aperture: alt. 10, diam. 8 mm.

*Hab.* Pondicherry; Pegu (*Stoliczka*).

Var. *viridis* (*Reeve*), Hanley MS., Reeve, Conch. Icon. 1862, sp. 20 (as *Paludina viridis*); Nevill, J. A. S. B. 1877, pt. 2, p. 31, & Anderson's Zool. Yunnan Exp. 1879, pl. 80, fig. 1; Nevill, Hand List, pt. 2, p. 30.

*Original description*:—Shell clavately conical, dark green, whorls rounded, smooth, rather constricted at the sutures, beneath the lens minutely decussately striated throughout.

Alt. 39, diam. 25 mm. (fig. in Conch. Icon.).

*Hab.* Kabyuet, Upper Burma (*Anderson*).

## Family VALVATIDÆ.

## Subfamily VALVATINÆ.

Shell umbilicate turbinate or subdiscoidal depressed; labrum continuous; operculum multispiral.

*Distribution.* Europe, N. Asia, N. America.

## Genus VALVATA.

*Valvata*, Muller, Verm. Hist. ii, 1774, p. 198; Zool. Dan. Prodr. 1776, p. 239.

*Buccinum*, d'Argenville.

*Nerita*, Geoffroy; Muller; Schroter; Gmelin; Alten.

*Helix*, Schroter; Gmelin; Montagu; Alten.

*Trochus*, Schroter.

*Cyclostoma*, Draparnaud; Voith; Lesueur.

*Turbo*, Donovan; Poiret; Montagu; Turton olim.

*Valvæarius*, Duméril.

*Paludina*, Menke olim; Michaud, Deshayes.

*Gyrorbis* & *Valvata*, Fitzinger.

*Volvata*, Berge.

TYPE, *Valvata cristata*, Müll.; Europe.

RANGE. Europe; N. Asia.

Shell umbilicate, turbinate or subdiscoidal, with little exerted spire, whorls few, not numerous; aperture circular, oblique; labrum continuous, thin; operculum multispiral.

186. *Valvata piscinalis* (Muller).

*Nerita piscinalis* & *pusilla*, Muller, Verm. Hist. pt. 2 (1774), pp. 171-172.

*Trochus cristatus*, Schröter, Gesch. Fluss-Conch. (1779), p. 280, pl. 6, fig. 11.

*Helix piscinalis* & *fascicularis*, Gmelin, Syst. Nat. (1788) pp. 3627, 3641.

*Nerita obtusa*, Studer, Coxe, Trav. in Switz. iii (1789) p. 436.

*Turbo fontinalis*, Pulteney, Cat. Shells Dorset. (1799), p. 45.

*Turbo cristatus*, Poiret, Coq. de l'Aisne (1801) p. 29 (not of Maton & Rackett).

*Cyclostoma obtusum*, Draparnaud, Tabl. Moll. (1801) p. 39.

*Valvata minuta*, Draparnaud, Hist. Moll. (1805) p. 42, pl. 1, figs. 36-38.

*Valvata piscinalis*, Férussac, Ess. Syst. Conch. (1807) p. 75.

*Lymnæa fontinalis*, Fleming, Edin. Encyc. vii (1814) p. 78.

*Valvata obtusa*, Brard, Coq. Paris (1815) p. 190, pl. 6, fig. 17.

*Turbo thermalis*, Dillwyn, Desc. Cat. Shells (1817) p. 852.

*Valvata depressa*, C. Pfeiffer, Deuts. Moll. i (1821) p. 100, pl. 4, fig. 33.

*Valvata moquiniana*, Regniés, Dupuy, Hist. Moll. v (1851) p. 586, pl. 28, fig. 15.

The following description of this species, which is widely spread

throughout Europe, Siberia, and Asia Minor, is taken from Reeve's "Land and Freshwater Mollusks indigenous to . . . . . the British Isles"—

Shell: somewhat globosely heliciform, deeply narrowly umbilicated, pale straw-colour, semitransparent but solid; whorls four and a half to five, depressed at the apex, longitudinally densely finely striated, spirally faintly ridged, ridges sometimes obsolete; aperture somewhat pyriformly rounded.

"*Valvata piscinalis* is almost milk-white, showing its bright blue-black eyes very conspicuously on the inner base of each tentacle."

It is recorded from Kashmir.

### 187. *Valvata* (?) *microscopica*, G. Nevill.

*Valvata* (?) *microscopica*, G. Nevill, Cat. Moll., Fasc. E, 1877, & Hand List, pt. 2, p. 17.

*Original description*:—Shell exceedingly minute, orbicular, moderately thin, depressed, and discoidal; whorls four, moderate, convex, with distinct suture, the last whorl increasing rapidly; the shell, both above and below, rugosely and distinctly spirally striated, deeply umbilicated, with rounded and proportionately rather large aperture: the specimens were coated with some thick black deposit; when cleaned the shell presents a brownish-red appearance; the operculum examined under the microscope is horny and circular, of comparatively rather thick substance; it appears to be multispiral, but we were not able to make out the structure quite satisfactorily.

Diam. 1.5 mm.

*Hab.* Port Canning, in brackish water.

## Family PILIDÆ [= *Ampullariidæ*].

### Subfamily PILINÆ.

Shell globose, large, holostome, with calcareous operculum.

### Genus *PILA*.

*Pila*, Bolten, Mus. Bolten. 1798.

*Ampullaria*, Lamarck, Mém. Soc. Hist. Nat. Paris, 1790, p. 76.

TYPE, *Helix ampullacea*, Linn.; Malaysia.

*Range.* S.E. Asia; C. Africa.

Shell turbate, globose, with little exerted spire; aperture oblong, oval; labrum arched, simple, occasionally reflexed; operculum calcareous.

188. *Pila globosa* (Swainson).

*Pila globosa* (Swainson), Zool. Illust. ser. 1, ii, pl. 119; Philippi, Monogr. Ampul. (Kuster's ed. Chemn.) p. 8, pl. 1, fig. 3; Reeve, Con. Icon, *Ampul.* figs. 46, 47; H. & T., C. I. pl. 113, fig. 3.

*Original description*:—Shell globose, very smooth, olive; spire depressed; margin of the aperture thick, fulvous, grooved; umbilicus small, contracted, placed near the base; operculum shelly.

Alt. 55·5, diam. 56·5 mm. (measurements of Swainson's figure).

*Hab.* Calcutta; Rohilkund; Orissa, etc. (Conch. Ind.).

Var. *sphaerica* (Hanley & Theobald), Conch. Ind. pl. 113, fig. 4.

Figured, but without description; the figure shows a much larger shell than the typical form, it is of a greenish-olive tint and painted with several narrow bands of a reddish hue, with an obliquely-set aperture.

Alt. 64·5, diam. 65 mm.

*Hab.* Moradabad.

Var. *fasciata* (Hanley & Theobald), tom. cit. fig. 5.

Also figured, but without description; the figure in this instance shows a more numerous banded form with a rather less oblique aperture.

Alt. 63·5, diam. 62 mm. (measurements of fig. in Couch. Ind.).

*Hab.* Moradabad.

Nevill in his 'Hand List' quotes a number of varieties as follows:—

Var. *sinistrorsa* (Nevill), Hand List, pt. 2, 1884, p. 2.

*Hab.* Calcutta.

Var. *incrassatula* (Nevill), Cat. Moll. Fasc. E, 1877, p. 4; Hand List, pt. 2, p. 2.

A small variety "distinguished by its greater relative thickness, by its (in living specimens) pure white peristome, slightly more exerted spire, absence of coloured bands, and by the unusually small umbilicus."

Alt. 32, diam. 28·5 mm.

*Hab.* Calcutta (Nevill); Dum-Dum (Wilmer).

Var. *minor* (Nevill), Cat. Moll. Fasc. E, 1877, p. 4; Hand List, pt. 2, p. 2.

A small variety with spire and aperture at base more produced than in the typical form; the columellar margin is widely expanded and stained of a rich dark chestnut-brown, the interior of the aperture being similarly coloured; it is of a thinner and more delicate texture than the var. *incrassatula*.

Alt. 36, diam. 30·5 mm.

*Hab.* Dum-Dum, near Calcutta (Wilmer); Siliguri (Mainwaring).

189. *Pila corrugata* (Swainson).

*Pila corrugata* (Swainson), Zool. Illust. ser. 1, iii, pl. 120 (badly copied in Kuster's ed. Chemn., *Ampul.* pl. 1, fig. 10); H. & T., C. I. pl. 113, fig. 2.

*Ampullaria globosa*, Sw., var. *corrugata*, Sw., Nevill, Cat. Moll., Fasc. E, p. 2.

*Original description*:—Shell globose, wrinkled, olive; spire prominent, acute, the whorls ventricose; margin of the aperture thick, fulvous, grooved; umbilicus small, linear, near the middle of the inner lip; operculum shelly.

Alt. 63, diam. 54 mm. (measurements of Swainson's figure).

*Hab.* Bengal; Pondicherry (Conch. Ind.).

Var. *longispira* (Nevill), Hand List, pt. 2, p. 2.

Rugosely malleated, peristome of a pale yellow colour.

Alt. 68, diam. 63 mm.

*Hab.* Benares (*Mainwaring*).

190. *Pila carinata* (Swainson).

*Pila carinata* (Swainson), Zool. Ill. ser. 2, *Ampul.* pl. 1, from which Philp. Mon., *Ampul.* (in Kuster's ed. Chemn.), pl. 1, fig. 2; P. Reeve, Con. Icon., *Ampul.* sp. 58; H. & T., C. I. pl. 114, fig. 1. *Ampullaria globosa*, Sw., var. *carinata*, Sw., Nevill, Cat. Moll., Fasc. E, p. 3.

*Original description*:—Shell olive, ventricose, without bands; whorls carinated near the suture.

The above description being so meagre, Philippi's description in Kuster's edition of Martini Chemnitz is given below:—

Testa globosa, lævissima, olivacea, fasciis destituta, anfractibus prope suturam carinatis, supra planis; apertura ovato-oblonga, infra medium latiore, fulvo limbata; labro subreflexo; umbilico mediocri ad dimidium labri sito.

Alt. 57, diam. 52·75 mm.

*Hab.* Ceylon.

191. *Pila malabarica* (Philippi).

*Pila malabarica* (Philippi) (not Reeve), Mon. *Ampul.* (Kuster's ed. Chemn.) p. 29, pl. 7, fig. 8; H. & T., C. I. pl. 114, fig. 2.

*Ampullaria globosa*, Sw., var. *malabarica*, Phil. Nevill, Hand List, pt. 2, p. 3.

*Original description*:—Testa ovata, anguste umbilicata, olivacea, unicolore, lævi; spira fere tertiam altitudinis partem æquante, subcontabulata; anfractibus ad suturam horizontalibus, ibique radiatim subrugosis, ultimo versus basin paullulum attenuato; apertura ovato-oblonga; peristomate intus incrassato.

Alt. 36·25, diam. 32 mm.

*Hab.* Mangalore.

192. *Pila layardi* (Reeve).

*Pila layardi* (Reeve), Con. Icon., *Ampul.* sp. 27; H. & T., C. I. pl. 114, fig. 4

*Ampullaria globosa*, Sw., var. *layardi*, Reeve, Nevill, Hand List, pt. 2, p. 3.

*Original description*:—Shell rather compressly globose, whorls narrowly flatly impressed round the upper part, then rounded, smooth, shining; umbilicus small, contracted; aperture ovate; whitish, covered with an olive horny epidermis.

Alt. 48, diam. 44 mm. (taken from fig. in Con. Icon.).

*Hab.* Colombo, Ceylon.

Var. *virens*, *Lamarck*, Hist. Anim. s. Vert. vi, 1822, p. 179, *Hab.*?; Nevill, Hand List, pt. 2, p. 3.

“..... carination at suture obsolete.”

*Hab.* Kollam (*Beddome*).

193. *Pila nux* (Reeve).

*Pila nux* (Reeve), Con. Icon., *Ampul.* sp. 132; H. & T., C. I. pl. 115, fig. 1.

*Original description*:—Shell oblong-conoid, solid, scarcely umbilicated, spire obtusely exserted, whorls convex, slanting and obsoletely plicately wrinkled at the suture; fulvous-chestnut; aperture ovate, rather small, columellar lip callously reflected.

Alt. 30, diam. 23 mm. (taken from fig. 132 a, pl. xxviii, in Conch. Icon.).

*Hab.* Bombay.

“A solid fulvous-chestnut shell of an oblong-conoid form, with the columellar lip rather unusually callously reflected.”

194. *Pila maura* (Reeve).

*Pila maura* (Reeve), Con. Icon., *Ampul.* sp. 57.

*Original description*:—Shell globose, narrowly umbilicated, spire rather short, whorls a little flattened at the sutures, then rounded, smooth; dark olive; aperture ovate, lip stained within with purple-black.

Alt. 45, diam. 41 mm. (taken from fig. in Conch. Icon.).

*Hab.* Assam (Conch. Ind.).

“Of a particularly globose form, the lip being characteristically stained within with purple or chestnut-black.”

195. *Pila theobaldi* (Hanley).

*Pila theobaldi* (Hanley), H. & T., C. I. pl. 115, fig. 2 (as *Ampullaria*).

*Ampullaria maura*, Reeve, var. *theobaldi*, Hanley, Nevill, Cat. Moll., Fasc. E, p. 6.

Figured as above, but not described, and as no specimen is

available to the author a few remarks only on the figure are possible. The shell appears to be of large dimensions, globular in form, of an olive-green tint ornamented with groups of narrow spiral reddish bands, each group varying in having from two to four bands in number, the umbilicus would appear to be moderately wide and the columella is diffused above into a well-defined, purplish, parietal callus which joins the upper margin of the labrum, the outer lip is rather irregularly streaked or blotched with the same colour and the aperture is obliquely ovate.

Alt. 80, diam. 77.5 mm.

*Hab.* Burma? or Pegu? (Conch. Ind.); Bhamo (Nevill).

196. *Pila saxeæ* (Reeve).

*Pila saxeæ* (Reeve), Con. Icon., *Ampul.* sp. 108; H. & T., C. I. pl. 115, figs. 3, 4.

*Original description*:—Shell oblong-ovate, rather solid, with a narrow covered umbilicus, spire rather obtuse, whorls a little depressed round the upper part, obsoletely angled, then rounded; olive; aperture pyriformly oblong, columellar lip thinly reflected.

Alt. 29, diam. 25 mm. (taken from fig. 3 in Conch. Ind.).

*Hab.* Bassein, Pegu (Conch. Ind.).

"An oblong-ovate shell, of rather solid texture, characterised by a faint depression round the upper whorls, causing a scarcely perceptible angle."

197. *Pila conica* (Gray).

(*Ampullaria*) *conica* (Gray), Wood's Index Test. Sup. p. 29, 1828, & Hanley, Conch. Misc. pl. iii, fig. 13.

*Ampullaria scutata*, Mousson, Moll. Java, 1849 (not of Phil.).

*Ampullaria javanica*, Reeve, var. 1856, *fide* Martens; from Cambodia *fide* Morelet; Nevill, Hand List, pt. 2, p. 5.

"Shell conically oblong, scarcely umbilicated; spire exserted; whorls convex, rather narrow, smooth; dark olive; aperture ovate, rather small; lip thin." (Reeve.)

Alt. 40.75, diam. 30.5 mm.

*Hab.* Java (Reeve); Moulmein (*Richthofen*, *Stoliczka*); Akyab (*Stoliczka*).

Var. *expansa*, Nevill, Cat. Moll., Fasc. E, p. 9, 1877.

*Ampullaria paludinoides*, H. & T., C. I. pl. 114, fig. 5 [not of Philippi or Crist. & Jan.]; Nevill, Hand List, pt. 2, p. 5.

*Original description*:—Testa subglobosa, umbilicato-perforata, plerumque glauca, fusco-zonata; epidermide olivacea; spira conica, tertiam altitudinis partem occupante; anfractibus ad suturam

horizontalibus; apertura oblongo-ovata; labro intus incrassato, obtuso.

Alt. 43, diam. 35 mm.

*Hab.* Mangalore; Pegu (type of var.) (*W. Theobald*); Tenasserim (*Stoliczka*); Mandalay (*Stoliczka*).

*Var. orientalis* (*Philippi*), Zeits. Malak. 1848, p. 192, "China"?

*Ampullaria scutata*, Phil. Conch.-Cab. ii, pl. 1, figs. 4, 5 [not of Mousson]; Nevill, Hand List, pt. 2, p. 5.

*Original description*:—Testa obovata, subimperfurata, satis tenui, obsolete fasciata, sæpius unicolore; epidermide nitida, olivacea; anfractibus convexis, superius subangulatis; spira dimidiam aperturam fere æquante, plerumque erosa; apertura ovato-oblonga, semilunari; operculo calcareo.

Alt. 39.5, diam. 36 mm.

Aperture: alt. 30 mm.

*Hab.* China; Bassein, Arakan (*Blanford*).

#### 198. *Pila dolioides* (Reeve).

*Pila dolioides* (Reeve), Con. Icon., *Ampul.* 1856, sp. 75; Nevill, Hand List, p. 7.

*Original description*:—Shell ovate, thin, ventricose, narrowly umbilicated, spire short, sharp; whorls convex, shining, impressed at the sutures, last whorl largely swollen and expanded; ash-olive, obscurely red-banded, bands linear, irregular; aperture very large, open, columellar lip reflected.

Alt. 56, diam. 47 mm. (dimensions of fig. 75 a in Conch. Icon.).

*Hab.* Bombay (*Reeve*); Ceylon (*Nevill*).

#### 199. *Pila mæsta* (Reeve).

*Pila mæsta* (Reeve), Con. Icon., *Ampul.* p. 92; H. & T., C. I. pl. 115, fig. 6.

*Original description*:—Shell ovately globose, narrowly umbilicated, spire rather exserted; whorls slightly flattened at the upper part, then rounded, smooth; dull olive, encircled with narrow darker bands; aperture lunar-ovate, lip yellowish-white within.

Alt. 36, diam. 30.75 mm. (taken from fig. in Conch. Icon.).

*Hab.* Ceylon.

"A dull greenish-olive species, of globose form, narrowly compressly umbilicated, encircled with numerous faint bands, irregular in width, but mostly linear."

#### 200. *Pila cinerea* (Reeve).

*Pila cinerea* (Reeve), Con. Icon., *Ampul.* sp. 94; H. & T., C. I. pl. 113, fig. 1.

*Original description*:—Shell globose, thin, rather inflated



narrowly umbilicated, spire short, whorls rounded, smooth, the last ascending in front; pale ash, encircled with three to four linear reddish-brown bands; aperture pyriformly ovate, columellar lip thinly reflected

Alt. 39·5, diam. 35·25 mm. (taken from fig. in Con. Icon.).

Hab. Ceylon.

"A peculiarly rounded species, thin and somewhat inflated, of a light ash-colour, encircled with faint bands, which, towards the apex, are like red-brown lines, of which only the uppermost one is visible."

## 201. *Pila olea* (Reeve).

*Pila olea* (Reeve), Con. Icon., *Ampul.* sp. 102.

*Original description*:—Shell subglobose, scarcely umbilicated, spire rather short, whorls rounded, longitudinally striated; shining olive, encircled with two distant narrow blackish-red bands; aperture pyriformly ovate.

Alt. 29, diam. 23·25 mm. (taken from fig. in Con. Icon.).

Hab. India?

"Of a peculiar compact subglobose form, with a shining olive surface, encircled with two distant linear bands."

## 202. *Pila tischbeini* (Dohrn).

*Pila tischbeini* (Dohrn), P. Z. S. 1858, p. 134; H. & T., C. I. pl. 114, fig. 8 (as *Ampullaria*).

*Original description*:—Testa ovato-globosa, solida, peranguste umbilicata, rude longitudinaliter, sub lente subtilissime spiraliter striata, olivacea, fasciis saturationibus cingulata; spira exserta; anfr. 3-4 integri convexi, rapide accrescentes, ad suturam impressam angulati; ultimus efflatus; apertura lunato-ovalis, intus fusca, dense fasciata: peristomium rectum, labro intus albido.

Alt. 33, diam. maj. 31, diam. min. 28 mm.

Aperture: alt. 25, diam. 17 mm.

Hab. Ceylon.

## 203. *Pila woodwardi* (Dohrn).

*Pila woodwardi* (Dohrn), P. Z. S. 1858, p. 134; H. & T., C. I. pl. 115, fig. 5 (as *Ampullaria*).

*Original description*:—Testa subturbinata, solidiuscula, parum nitida, longitudinaliter striata, late umbilicata, olivacea, fasciis viridibus vel fuscis spiralibus ornata; spira exserta; anfractus 4-4½ integri convexi, rapide accrescentes, supra medium angulati; ultimus efflatus, antice descendens; apertura ovato-lunaris, alba, fasciis intus pellucidibus; peristomium simplex, rectum.

Alt. 29, diam. maj. 26, diam. min. 22 mm.

Aperture: alt. 19·5, diam. 11·5 mm.

Hab. Ceylon.

204. *Pila alucinans* (Sowerby).

*Pila alucinans* (Sowerby), Proc. Malac. Soc. ix, p. 63 (fig. in text)  
(as *Ampullaria*).

*Original description* :—Testa late turbinata, mediocriter umbilicata, fusco-olivacea, fasciis numerosis angustis nigro-fuscis ornata, longitudinaliter irregulariter plicata et striata, stris transversis subtilissimis decussata; spira brevis; anfractus convexi, supra planulati; ultimus latiusculus, superne rotunde angulatus, supra angulum leviter depressus, infra angulum rotunde convexus, basim versus leviter contractus; apertura latiuscula, intus fasciata; peristoma tenue.

Alt. 23, diam. 23 mm.

Aperture: alt. 22, diam. 12 mm.

*Hab.* Ceylon.

205. *Pila winkleyi* (Pilsbry).

*Pila winkleyi* (Pilsbry), Proc. Acad. Nat. Sci., Philadelphia, liii, 1901, p. 189, pl. 5, figs. 2, 3 (as *Ampullaria*).

*Original description* :—Shell narrowly umbilicate, globose; yellowish-olive, uniform or with few or numerous dusky olive spiral bands, the earlier whorls eroded, blackish or ruddy. Surface smooth, somewhat shining, under a strong lens seen to be very densely, microscopically striated spirally, the striæ minutely granulose; spire low-conic; sutures impressed, the whorls flattened below them, elsewhere symmetrically convex. Aperture vertical, semi-rotund, narrower above, reddish-tawny and sometimes banded within, becoming white near the lip; peristome a trifle expanded below, white or dirty yellowish, the outer margin equably curved, columella concave, blunt and more or less thickened but not reflexed, parietal callus rather thin, white, thinner within. Operculum thick and solid, concave externally, and partially covered with a thin, yellowish-brown cuticle. Inside bluish, with a mica-like gleam, the scar of attachment sunken, the columellar side concentrically striate, the enclosed eminence narrow, curved and smooth.

Alt. 58, diam. 50 mm.

Aperture: alt. maj. 43 mm.

*Hab.* Henzada, Burma (*Winkley*).

Types in Coll. Acad. Nat. Sciences, Philadelphia.

## Order PULMONATA.

## Suborder HYGROPHILA.

## Family LIMNÆIDÆ.

## Subfamily ANCYLINÆ.

Shell patelliform, without spine.

*Distribution.* Temperate and Tropical Regions of the World.

## Genus ANCYLUS.

*Ancylus*, Geoffroy, *Traité de Coq. de Paris*, 1767; Clessin, *Conch.-Cab.*, 1882, p. 11, etc.

TYPE, *A. fluviatilis*, Linnæus, from Europe generally, Algeria and Madeira.

*Range.* Europe, Asia.

Shell small, patelliform, either dextral or sinistral, thin, conoidal; aperture either ovate or rounded; peristome acute, simple.

Animal having the lateral teeth of the tongue narrow, sharp pointed, and the cardinal [median] tooth, small, rounded.

206. *Ancylus baconi*, Bourguignat.

*Ancylus baconi*, Bourguignat, *Cat. Ancyl. in Journ. de Conch.* iv, 1853, p. 181; *Bourg. Descr. Ancyl. Cuming in P. Z. S.* 1853, p. 89, pl. 25, figs. 18-25; H. & A. Adams, *Gen. Rec. Moll.* ii, 1855, p. 266; *Bourg. Spicil. Malac.* 1862, p. 205; Clessin in *Conch.-Cab.* 1882, p. 61, pl. 7, fig. 7.

*Original description*:—Testa antice recta vel paululum convexa, postice recta vel paululum concava; apice postico, obtusissimo, paululum dextrorsus dejecto; depressione apicali vix conspicua, in extremitate verticis sita. Testa parva, fragili, diaphana, lævissima, vel concentrice striatula; epidermide albido-virescente; apertura ovata.

Alt. 1, diam. maj. 3, diam. min. 2 mm.

*Hab.* Bengal.

207. *Ancylus ceylanicus*, Benson.

*Ancylus ceylanicus*, Benson, *A. M. N. H. ser. 3*, xiii, 1864, p. 139; H. & T., *C. I.* pl. 81, figs. 2, 3.

*Original description*:—Testa suboblange conoidea, antice convexa, postice concava, extus tenuissime radiato-costulata, costis subremotis elevatioribus munita, striis confertis concentricis decussata, viridescenti-cornea, margine lato, lutescenti-cornea, apice

submediano, subelongato, postice attenuato, acutiusculo, ad dextrum leviter verso; apertura subrotundato-ovata, intus albida nitente.

Alt. 2·5, diam. maj. 6, diam. min. 4 mm.

*Hab.* Matelle (Matale) District, Ceylon.

Resembling in some respects the *A. fluviatilis* of Europe.

208. *Ancylus tenuis*, Bourguignat.

*Ancylus tenuis*, Bourguignat, Spicil. Malac., 1862, p. 208, Clessin, in Conch.-Cab. 1882, p. 62.

*Original description*:—Testa pygmea, depresso-oblonga, fragili, lævi, cornea, vel luteolo-nigrescente; — antice sinistrorsusque paululum convexa; postice dextrorsusque recta, vel paululum concava; — apice maximo, obtusissimo, paululum canaliculato, postico, dextrorsus paululum dejecto; — depressione apicali minima, rotundata, ad sinistram partem verticis sita; — apertura oblonga.

Alt. 1·5, diam. maj. 2 mm.

*Hab.* Streams in the Nilgiri Hills.

209. *Ancylus verruca*, Benson.

*Ancylus verruca*, Benson, A. M. N. H. 1855, ser. 2, xv. p. 12; H. & T., C. I. pl. 81, figs. 2, 3; Clessin, in Conch.-Cab. 1882, p. 62.

*Original description*.—Testa vix sinistrorsa, depressa, subelongato-ovata, postice vix angustiori-lævigata, pallide virente-flavida vel cinerea, tenui, intus albida, submargaritacea, antice superne convexiuscula, postice prope umbonem breviter declivi, umbone vix elevato, compressiusculo, submediano, ad spatium  $\frac{2}{5}$  totæ testæ posita.

Alt. 1, diam. maj. 3·5, diam. min. scarcely 2 mm.

*Hab.* Bhuntâl; Kemaon Lake; marshes near Moradabad; near Budaon Rohilla; Orissa; Ceylon, etc., always adhering to the floating leaves of water plants.

From Benson's notes, attached to his original description, it would seem that the present species, though generally sluggish in its habits, is able to swim shell downwards on the surface of the water.

Subfamily LIMNÆINÆ.

Shell ovate or fusiform with exserted, or more or less contracted, spire.

*Distribution.* World-wide.

Genus **LIMNÆA**.

*Limnæa*, Lamarck, 1799, Mém. Soc. Hist. Nat., Paris, p. 75, as  
*Lymnæa*, emend. Rang, 1829, Man. de l'Hist. Nat., Moll. p. 176;  
 Sowerby in Reeve, Con. Icon. xviii, etc.

*Helix*, Linn., Gmelin, Burrow.

*Bucinum*, Müller.

*Bulinus*, Poiret, Bruguière.

*Limnæus*, Draparnaud, Born.

*Limnæa*, Lamarck, Nilsson.

*Stagnicola*, Leach.

*Limnæus*, auct. reliq.

TYPE, *L. stagnalis* (Linnæus); Europe generally.

Range. World-wide.

Shell dextrally spiral, horny-testaceous, ovate or pyramidal, covered with a thin epidermis; spire acuminate, whorls generally turreted, inner lip of the aperture narrowly spread on the body-whorl, generally with a single plait. No operculum.

Animal rather long and twisted in a spiral coil; head prominent; tentacles short, triangular and flattened; foot oblong, bilobed or notched in front and obtusely rounded behind.

Section *LIMNÆA* (*sensu stricto*).

For characters, type and range, see above.

210. *Limnæa* (*Limnæa*) *stagnalis* (*Linneus*).

*Limnæus*, Linn., 1758, Syst. Nat. 10th ed. p. 774, as *Helix stagnalis* and *fragilis*.

*Limnæa* (*Limnæa*) *stagnalis*, Lamarck, 1801, as *Lymnæa stagnalis*, Syst. Anim. sans Vert. p. 91; Sowerby in Reeve's Conch. Icon. xviii, pl. 1, no. 4; H. & T., C. I. 1876, p. xvi.

*Lymnæa stagnalis*, in Reeve, L. & F. W. Moll. British Isles, p. 160.

"Shell: ovately turreted, compressly umbilicated, rather thin, yellowish horny, spire produced and sharply acuminate; whorls five to six, slopingly convex round the upper part, then ventricose, striated in the direction of the lines of growth, sometimes evanescently obscurely irregularly ridged and malleated in the opposite direction; aperture moderate, somewhat squarely ovate, columella callously twisted, lip broadly appressly dilated over the umbilicus." (Reeve.)

Alt. 47.5, diam. 22.5 mm. (spec.).

Hab. Europe; Afghanistan; Kashmir.

211. *Limnæa* (*Limnæa*) *acuminata*, Lamarck.

*Limnæa* (*Limnæa*) *acuminata*, Lamarck, Anim. s. Vert. vi, pt. 2, p. 160; Deles. Rec. Coq. Lam. pl. 30, fig. 6; H. & T., C. I. pl. 69, figs. 8, 9; Sowerby, in Reeve's Conch. Icon. xviii, pl. 10, no. 66.

Original description:—Testa ovato-ventricosa, tenuissima, hyalina, subalbida; spira brevissima, apice acuminata.

Alt. 25 mm.

Hab. Bengal; 30 miles S.E. of Hingola, etc.

Sowerby's description in Reeve is as follows:—

"Shell oblong, ventricose, reddish purple, thin, semipellucid, smooth, spire short, narrow, whorls attenuated; last whorl slightly angular above, inflated below the middle; aperture large, rounded anteriorly, columellar lip tortuous."

The species, as are most of the group, is exceedingly plastic, and a number of varieties have been described by various authors as follows:—

Var. *patula*, *Troschel*, in *Wiegmann's Archiv* for 1837, iii, p. 167; H. & T., C. I. 1876, pl. 69, figs. 2, 3.

*Original description*:—Testa imperforata vel vix rimata, ovato-acuta, tenuissima, pellucidissima; spira mediocri, acuta; ultimo anfractu ventricoso;  $\frac{3}{4}$  testæ longo, margine exteriore patulo, anfr. 5-6.

Alt. 44, breadth of the last whorl 24, height of the last whorl 13, height of the aperture 33 mm.

*Hab.* Ganges.

Var. *sulcatula*, *Troschel*, von Martens, *Conchologische Mittheilungen*, i, p. 75, pl. 14, fig. 6.

*Limnæus sulcatulus*, *Troschel* in *Wiegmann's Arch. für Naturg.* iii, 1837, p. 167.

*Limnæus striatus* (Benson), Kuster, in *Conch.-Cab.*, Martini & Chemnitz, Lim. p. 33, pl. 6, figs. 11, 12

*Limnæa amygdala* (non *Troschel*), H. & T., C. I. pl. 69, figs. 7, 10.

*Original description*:—Testa rimata, ovata, acuta, tenui, longitudinaliter sulcata; spira mediocri, acuta; ultimo anfractu  $\frac{3}{4}$  testæ longo; apertura ovata, plica columellari profunda. Anfr. 5-6.

Alt. 33, breadth of last whorl 17.5, height of last whorl 15.25, alt. of aperture 21.75 mm.

*Hab.* Bengal (*Lamare-Picquot*).

Var. *amygdalum*, *Troschel*, von Martens, *Conch. Mittheil.* i, p. 76, pl. 14, figs. 7, 8.

*Limnæa amygdalus*, *Troschel*, *Wiegmann's Archiv*, iii, 1837, p. 168; Kuster, ed. Martini & Chemn., Lim. p. 35, pl. 6, figs. 15, 16.

*Original description*:—Testa imperforata vel vix rimata, colore stramineo vel cycaceo, nitida, ovata; spira mediocri, acuta; ultimo anfractu  $\frac{3}{4}$  testæ longo, margine exteriore plus minus adpresso. Anfr. 5, rarissime 6.

Alt. 28.75 breadth of last whorl 17.5, height of last whorl 13.25, alt. of aperture 20.75 mm.

*Hab.* India.

Var. *prunum*, *Troschel*, von Martens, Conch. Mittheil. i, p. 81, pl. 15, figs. 1, 2.

*Limnæus prunum*, Troschel in Wiegmann's Archiv. fur Naturg. iii, 1837, p. 170.

*Limnæus singaporinus*, Kuster, in Conch.-Cab., Martini & Chemn., Lim. p. 35, pl. 6, fig. 17.

*Limnæa ovalis*, Gray, Reeve in Conch. Icon. xviii, pl. 9, fig. 59 (small).

*Limnæa luteola*, Lk., Reeve, id. pl. 15, fig. 104; H. & T., C. I. pl. 70, fig. 6.

*Original description*:—Testa ovata, rimata, subglabra, subtiliter striata; spira globoso-acuta, anfractibus convexis, suturis profundis; ultimo anfractu testæ dimidium superante; apertura ovato-acuta. Anfr. 6.

Alt. 26·75, breadth of last whorl 15·25, height of last whorl 13·25, alt. of aperture 17·5 mm.

*Hab.* Bengal (*Lamare-Picquot*).

Var. *cerasum*, *Troschel*, von Martens, Conch. Mittheil. i, p. 81, pl. 15, figs. 3, 4.

*Limnæus cerasum*, Troschel in Wiegmann's Archiv fur Naturg. iii, 1837, p. 170.

*Limnæus petinoides* (Benson), Kuster, in Conch.-Cab., Martini & Chemn., Lim. p. 34, fig. 6, fig. 14.

*Limnæa ovalis*, Gray, Reeve in Conch. Icon. xviii, pl. 9, figs. 59, a, b.

*Limnæa luteola* (Lam.), H. & T., C. I. pl. 70, fig. 5.

*Original description*:—Testa subglobosa, rimata; spira prominula, acuta; ultimo anfractu ventricosissimo  $\frac{2}{3}$  testæ longo; apertura ovato-acuta. Anfr. 6.

Alt. 21·75, breadth of last whorl 16·75, height of last whorl 13·25, alt. of aperture 17·5 mm.

*Hab.* Bengal (*Lamare-Picquot*).

Var. *strigata*, *Hanley & Theobald*, Conch. Ind. pl. 70, fig. 4.

Said to have the aspect of var. *cerasum*, Troschel.

*Hab.* Jounpore.

Var. *chlamys*, *Benson*, von Martens, Conch. Mittheil. i, p. 76.

*Limnæa chlamys*, Benson, Journ. Asiat. Soc. Bengal, 1836, v, p. 744; H. & T., C. I. pl. 69, figs. 5, 6; Reeve, Conch. Icon. xviii, pl. 10, fig. 65.

*Original description*:—Testa translucida, cornea aut castanea, elongato-ovata; spira gracili, brevior, acuminata; anfractu ultimo infra præcipue ventricosissimo; suturis parce depressis; apertura infra patente, basi leviter evasa.

The dimensions of two specimens given by von Martens are as below:—

Alt. 29, diam. maj. 19, diam. min. 13·5; apertura, alt. 22·5, diam. 12 mm.

Alt. 31, diam. maj. 18, diam. min. 13; apertura, alt. 21·5, diam. 12 mm.

*Hab.* Calcutta (*Nevill*), Benares and Moradabad (*Benson & Theobald*).

*Var. rufescens*, *Gray*; von Martens, *Conch. Mittheil.* i, p. 76, pl. 14, fig. 3.

*Limnæa rufescens*, *Gray*, in *Sowerby's Genera Shells*, pt. vii, *Limn.* fig. 2; *Reeve, Conch. System.* pl. 191, fig. 2; *H. & T.*, C. I. 1876, pl. 69, figs. 1, 4, and pl. 70, fig. 1.

*Limnæa chlamys*, *Benson*, in part.

Shell oblong-lanceolate, thin, hyaline, purplish-red, whorls 4. Spire very short, acute, sutures very oblique. Aperture lanceolate, elliptical. Columella very oblique.

Diameter to the length as 6 to 13.

*Hab.* Ganges etc.

*Var. sylhetica*, *Hanley & Theob.*, C. I. pl. 70, fig. 9.

According to the figure in the 'Conchologia Indica,' a form with short spire and rather inflated whorls.

*Hab.* Maishes in Sylhet.

*Var. gracilior*, von Martens, *Conch. Mittheil.* i, p. 77.

*Limnæa rufescens* (*Gray*), *Reeve* in *Conch. Icon.* xviii, pl. 3, figs. 14 a, b; *H. & T.*, C. I. pl. 70, fig. 1.

*Original description*:—Minor, pallide flavescens (vel rosea), valde gracilis, antractu ultimo supra perangusto, margine aperturæ externo simplice, oblique paulum arcuato.

Alt. 24, diam. maj. 10, diam. min. 7 mm.

Aperture: alt. 16, diam. 6·5 mm.

*Hab.* Bengal (*Nevill*).

## 212. *Limnæa* (*Limnæa*) *ovalis*, *Gray*.

*Limnæa* (*Limnæa*) *ovalis*, *Gray*, in *Sow. Gen. Shells*, pt. vii, *Limn.* fig. 4; *Reeve, Conch. Syst.* pl. 191, fig. 4; *H. & T.*, C. I. 1876, pl. 70, figs. 2, 3.

Shell oval, pellucid, pale horn-colour: finely transversely striate, whorls 5. Spire very short, acute, suture almost horizontal. Aperture oval, elliptical.

Diameter to the length as 5 to 9.

*Hab.* Calcutta; Almorah, etc.

*Var. nucleus*, *Troschel*; von Martens, *Conch. Mittheil.* i, p. 82, pl. 15, figs. 8, 9.

*Limnæus ovalis*, *Gray*; *Sow. Gen. Shells*, pl. 43, fig. 4; *H. & T.*, C. I. pl. 70, figs. 2, 3.

*Limnæus nucleus*, *Troschel*, *Martens, Conch. Mittheil.* p. 171; *Reeve, Conch. Icon.* pl. 10, fig. 67.



*Original description*:—Testa ovata, vix rimata, cornea; anfractu ultimo  $\frac{2}{3}$  testæ longo, impresso; apertura ovata, margine exteriore impresso subcordata; margine columellari reflexo. Anfr. 6.

Alt. 22, breadth of last whorl 15·75, height of last whorl 13, alt. of aperture 15·75 mm.

*Hab.* Bengal (*Lamare-Picquot*).

213. *Limnæa* (*Limnæa*) *tigrina*, *Dohrn*.

*Limnæa* (*Limnæa*) *tigrina*, Dohrn, P. Z. S. 1858, p. 134; von Martens, Conch. Mittheil. i, p. 85, pl. 15, fig. 5

*Limnæa pinguis*, var. *strigata*, Reeve, Conch. Icon. xviii, pl. 9, fig. 18 b.

*Original description*:—Testa oblonga vel ovato-oblonga, imperforata vel vix rimata, tenuis, pellucida, nitida, cornea, longitudinaliter irregulariter albofasciata, subtilissime spiraliter et longitudinaliter striata; sutura simplex, plerumque brunnea; spira acuta, apice fuscescente; anfr. 4-5 vix convexi, ultimus effatus,  $\frac{3}{4}$  longitudinis subæquans; apertura ovato-oblonga vel oblonga; peristomium simplex, rectum, margine columellari reflexo; marginibus callo albido, non nitido, junctis.

Alt. 25, diam. 13 mm.

Aperture: alt. 16, diam. 8 mm.

*Hab.* Ceylon.

Var.  $\beta$ . Var. *minor*: cornea vel albida, interdum unicolor.

Alt. 19, diam. 10 mm.

Aperture: alt. 14, diam. 7 mm.

*Hab.* Ceylon.

Section *GULNARIA*.

*Gulnaria*, Leach, Syn. Moll. Great Britain. 1852, p. 106.

TYPE, *Limnæa pereger*, Draparnaud; Europe.

Range. World-wide.

*Original description*:—Testa spira brevissima, abrupte formata, ad apicem acuminata. Umbilicus perforatus, apertus. Tentacula latissima. Pallium non dilatatum.

214. *Limnæa* (*Gulnaria*) *pereger* (*Drap.*).

*Limnæa* (*Gulnaria*) *pereger* (Drap.), Tabl. Moll. 1801, p. 48; H. & T., C. I. 1876 (as *L. peregra*, Linn.).

*Limnæa limosa*, Linn., Reeve, L. & F. W. Moll. British Isles, p. 57.

Shell: obliquely ovate, compressly minutely umbilicated, rather thin, yellowish horny, spire short, acuminate; whorls four, convex, irregularly striated in the direction of the lines of growth, the last much the largest, ventricosely inflated; aperture ovate, columella arcuately twisted, lip broadly appressed over the umbilicus. (*Reeve*.)

Alt. 19, diam. 12 mm. (spec.).

*Hab.* Europe; Afghanistan; Kashmir.

215. *Limnæa* (*Gulnaria*) *auricularia* (*Drap.*).

*Limnæa* (*Gulnaria*) *auricularia* (*Drap.*), as *Lymnæus auricularius*,  
Tabl. Moll. 1801, p. 48.

*Limnæus*, Syst. Nat. 10th ed. 1758, p. 774, as *Helix auricularia*,  
H. & T., C. I. 1876, p. xvi.

*Lymnæa auricularia*, in Reeve, L. & F. W. Moll. British Isles,  
p. 159.

"Shell: somewhat squarely semiglobose, compressly umbilicated, rather thin, pallid horny, spire very small, sharp; whorls three to four, convex, irregularly striated in the direction of the lines of growth, sometimes evanescently obscurely irregularly ridged and malleated in the opposite direction; extremely rapidly enlarging, last whorl abruptly widely auricularly inflated; aperture very large, outer lip thinly expanded, columella callously twisted, lip appressly dilated over the umbilicus." (*Reeve.*)

Alt. 30, diam. 23 mm. (spec.).

*Hab.* Europe; Afghanistan; Kashmir.

216. *Limnæa* (*Gulnaria*) *brevicauda* (*Sowerby*).

*Limnæa* (*Gulnaria*) *brevicauda* (*Sowerby*), Con. Icon., *Limn.*,  
sp. 105; H. & T., C. I., pl. 158, fig. 7.

*Original description*:—Shell obliquely tortuous, pale horn, ventricose; spire short, acuminate; whorls three, small; last whorl much inflated, rather short, excavated behind the columella, aperture expanded, anteriorly subacuminate; columellar fold prominent, spirally tortuous.

From the figure in the 'Conchologia Indica' the dimensions would seem to be about as follows:—Alt. 21, diam. maj. 17 mm. It is probably a form of *L. auricularia*, Linn.

*Hab.* Kashmir (*W. Blanford*).

Sowerby's specimen was said to be from Australia, but this was undoubtedly an error.

217. *Limnæa* (*Gulnaria*) *hookeri* (*Reeve*).

*Limnæa* (*Gulnaria*) *hookeri* (*Reeve*), P. Z. S. 1850, p. 49; Grav, op. cit. 1856, p. 186; Sowerby, in Reeve, Conch. Icon. xviii, pl. 11, sp. 74; Olessin, in Conch.-Cab. 1886, p. 381, pl. 42, fig. 3; Preston, Rec. Ind. Mus., Calcutta, iii, pt. 2, no. 3, p. 115.

*Original description*:—Testa ovata, tenuicula, conspicue umbilicata, anfr. 4-5, convexis, superne depresso-rotundatis, suturis subimpressis, apertura orbiculari-ovata, marginibus lamina latiuscula subverticali conjunctis; sordide olivaceo-fusca.

Alt. 17, diam. 10 mm.

*Hab.* Thibetian or North side of Sikkim Himalaya at 1800 feet elevation (*Hooker*); Gyantze, 13,120 feet, Mang-tsa, 14,500 feet; Se-chen, 13,100 feet, Thibet (*Stewart*).

Reeve, in his paper describing the shell, seems to think that it is closely related to *L. pereger*, the common European form, an

idea which is certainly borne out by its general aspect. When, however, recently working out some material for the Indian Museum, the author had occasion to send specimens of what, after comparison with the type specimen in the British Museum, he believed to be this species to the Rev. E. W. Bowell for dissection, his report states "that the genitalia are very similar to those of the common European form *L. auricularia*, Linn. The vas deferens is, however, markedly shorter, and the radula is remarkable for the length of the cusps and their subulate appearance, and also for there being no great distinction in type between the laterals and marginals."

Reeve, in his description, gives no actual dimensions, but those above given are taken from his smaller figure which is said to be of natural size.

218. *Limnæa* (*Gulnaria*) *auriformis* (*Clessin*).

*Limnæus auriformis*, Clessin, in Conch.-Cab. 1886, p. 391, pl. 43, fig. 11.

*Original description*:—Testa auriformis, angustissime rimata, solida, leviter striata, pallide cornea; spira minuta, acuta; anfr. 4, valde convexi, sutura profunda separati, celerrime accrescentes; penultimus et ultimus inflatus, ultimus  $\frac{4}{5}$  longitudinis æquans; apertura ampla, auriformis; peristoma acutum; marginibus callo columellari levi conjunctis; columella fere recta.

Alt. 12.3, diam. 10.5 mm.

*Hab.* India.

219. *Limnæa* (*Gulnaria*) *labiosa* (*Philippi*).

*Limnæa* (*Gulnaria*) *labiosa* (Philippi), Clessin, in Conch.-Cab. 1886, p. 397, pl. 16, figs. 3-4 (as *L. labiosa*).

*Original description*:—Testa ovata, tenuis, cornea; spira brevis, acuta; anfr. 5, convexi, celeriter accrescentes, sutura leviter impressa separati; ultimus inflatus,  $\frac{2}{3}$  longitudinis æquans; apertura ovata, superne acuminata, peristoma acutum, marginibus callo columellari tenui latissimo conjunctis; columella valde contorta.

Alt. 21, diam. 11.75 (fig. 3, pl. 16, in Conch.-Cab.).

*Hab.* India.

220. *Limnæa* (*Gulnaria*) *succinea* (*Deshayes*).

*Limnæa* (*Gulnaria*) *succinea* (Deshayes), Voy. dans l'Inde par Bélanger, Zool. p. 418, pl. 2, figs. 13, 14; Deshayes in Lamarck, Anim. s. Vert. ed. 2, viii, p. 417, no. 15.

*Limnæus succineus*, Desh., Kuster, in Conch.-Cab., Martini & Chemnitz, Lim. p. 29, pl. 5, figs. 18, 19.

*Original description*:—Testa ovato-acuta, tenuissima, fragili, succinea, lævigata; spira acuta; anfractibus convexiusculi, ultimo

maximo; apertura ovata-acuta, basi dilatata; marginibus integris, tenuissimis, acutis; columella contortuplicata.

Alt. 22, diam. 12.

Hab. Malabar.

Var. **impura** (*Troschel*), von Martens, Conch. Mittheil. i, p. 86, pl. 15, figs. 6, 7.

*Limnæus impurus*, Troschel, in Wiegmann's Archiv für Naturgeschichte iii, 1837, p. 172

*Original description*:—Testa ovato-oblonga, rimata, tenui subtiliter striata, fusca, subolivacea; spira medioeri, acuta, suturis satis excavatis; ultimo anfractu subventricosus, testæ dimidium superante, apertura ovata, plica columellari nullo vel exigua. Anfr. 5.

Alt. 15·5, breadth of last whorl 8·5, height of last whorl 6·5; alt. of aperture, 8·5 mm.

Hab. Bengal (*Lamare-Picquet*).

221. **Limnæa (Gulnaria) hians** (*Sowerby*).

*Limnæa (Gulnaria) hians* (*Sowerby*), in Reeve, Conch. Icon. xviii, pl. 9, sp. 57; Clessin, in Conch.-Cab. 1886, p. 392, pl. 45, fig. 9.

*Original description*:—Shell thin, semipellucid, polished, ovate-oblong, subfusiform, pale horny; spire acuminate, elevated whorls three, narrow: last whorl ovate; aperture auriform, columellar fold tortuous, outer lip more or less expanded. (*Sowerby*.)

Hab. Malabar.

Closely related to, if not identical with *L. succinea*, Desh.

222. **Limnæa (Gulnaria) pinguis** (*Dohrn*).

*Limnæa pinguis* (*Dohrn*), P. Z. S. 1858, p. 134; H. & T., C. I. pl. 70, figs. 7-10.

*Original description*:—Testa imperforata vel vix rimata, ovato-oblonga, pellucida, tenuis, nitidissima, longitudinaliter levissime striata, cornea vel albicans; sutura simplex, albida; spira elevata apice acuto, rubicundo; anfr. 4-4½ convexiusculi, ultimus ⅔ longitudinalinis subæquans; apertura obliqua, ovato-oblonga; peristomium rectum, simplex, margine columellari reflexo; marginibus callo tenui junctis.

Alt. 18, diam. 9·5 mm.

Aperture: alt. 11·75, diam. 5·5 mm.

Hab. Ceylon (*Dohrn*); Bombay (*Peile*); Madras (*Dalghiesh*).

223. **Limnæa (Gulnaria) siamensis** (*Sowerby*).

*Limnæa (Gulnaria) siamensis* (*Sowerby*), in Reeve, Conch. Icon. xviii, sp. 63; Clessin, in Conch.-Cab. 1886, p. 330, pl. 50, fig. 9.

*Original description*:—Shell ovate, obese, smooth, finely red-

lined; spire rather short, conical, acuminate; whorls 3, small, a little convex: aperture pyriform, rounded anteriorly, columellar fold strong, raised to the middle, arched.

Alt. 24, diam. maj. 12·25 (fig. in Conch. Icon.).

Hab. Siam.

Resembling *Limnæa pinguis*, but marked with reddish lines. (Sowerby.)

224. *Limnæa* (*Gulnaria*) *simulans* (Preston).

*Limnæa* (*Gulnaria*) *simulans* (Preston), Rec. Ind. Mus. Calcutta, ii, pt. 1, 1908, p. 46, fig. 6 (as *L. simulans*).

*Original description*.—Shell fusiform, brownish horn colour; whorls 5; sutures impressed; umbilicus narrow, partly concealed by the reflexed columella; columella arched, thick, extending into a callus which reaches the lip above; peristome simple; aperture inversely auriform.

Alt. 7·75, diam. maj. 4·25 mm.

Aperture: alt. 4, diam. 2 mm.

Hab. Pharping, Nepal.

Section *BULIMNEA*.

*Bulimnea*, Haldeman, Mon. Freshwater Univ. Moll. U.S.A. 1842 (*Limnea*), p. 6.

TYPE, *Limnæa megasoma*, Say; N.W. Territory, U.S.A.; Vermont, U.S.A.

Range. N. America; Europe; Asia.

*Original description*.—Shell thick in texture, inflated, lip not expanded.

225. *Limnæa* (*Bulimnea*) *truncatula* (Jeffreys).

*Limnæa* (*Bulimnea*) *truncatula* (Jeffreys), Trans. Linn. Soc. xvi, 1830, p. 7 (as *Limnæus truncatulus*); Muller, Verm. Hist. 1774, pt. 2, p. 130 (as *Buccinum truncatulum*); H. & T., C. I. 1876, p. 16.

*Limnæa truncatula*, in Reeve, L. & F. W. Moll. British Isles, p. 164.

Shell: acuminate ovate, distinctly umbilicated, rather solid, yellowish horny, spire rather produced; whorls 5 to 6, convex, truncate next the sutures, roughly and often densely striated in the direction of the lines of growth; aperture rather small, ovate, columella callous, but little twisted, lip elongately expandedly reflected round the circumference of the umbilicus. (Reeve.)

Alt. 13, diam. 7·75 mm. (spec.).

Hab. Europe; Afghanistan; Kashmir.

226. *Limnæa* (*Bulimnea*) *bowelli* (Preston).

*Limnæa* (*Bulimnea*) *bowelli* (Preston), Rec. Ind. Mus. iii, pt. 2, no. 3, p. 115, figs. (as *L. bowelli*).

*Original description*.—Shell rimate, acuminate ovate, rather

solid, polished, shining, pale yellowish horn colour; whorls 4, shouldered above, marked with rather coarse lines of growth; sutures deeply impressed; columella descending obliquely and diffused above into a thick callus which joins the upper margin of the peristome; peristome simple; aperture ovately, inversely auriform.

Alt. 8.5, diam. maj. 5.25.

Aperture: alt. 5, diam. 3.75 mm.

*Hab.* Te-ring Gompa, 14,000 feet; Mang-tsa, 14,500 feet; High Hill, Gompa, Gyantse Valley, 14,500 and Gyantse, 13,120 feet, in small streams.

"Mr. Bowell informs me that the radula bears a strong resemblance to that of *L. glabra*, Müll., but has fewer laterals, the general appearance being more suggestive of the radula of a *Planorbis* than that of a *Limnæa*; the maxilla is also very remarkable, with a large blunt beak arising from the centre of the semicircular piece."

### Subfamily PLANORBIINÆ.

Shell sinistral, spire flattened or elevated.

*Distribution.* World-wide.

### Genus PLANORBIS.

*Planorbis*, Geoffroy, Coq. de Paris, 1767, pp. 12, 81; Guettard, 1756 (pre-Linnean).

*Coretus*, Adamson, 1757.

*Helix* (pars), Linnæus, 1758.

*Angarus*, Martens, 1773.

*Orbis*, Schröter, 1776.

*Nautilus*, Lightfoot, 1786.

TYPE of genus, *P. corneus*, Linn.

*Range.* World-wide.

Shell spiral, sometimes sinistral, spire depressed, whorls 3 to 7; aperture semilunar, or ovate or trigonal, margin generally thin.

#### 227. *Planorbis exustus*, Desh.

*Planorbis exustus*, Desh., Bélang. Voy. Ind. Orient., Zool. 1834, p. 417, pl. 1, figs. 11-13; ed. Lam. viii, p. 392; Muller, Synopsis Test. p. 34.

*Planorbis indicus*, Benson, J. A. S. B. v, 1836, p. 743; Martens, Mal. Blatt. xiv, p. 212; H. & T., C. I. pl. 39, fig. 10, & pl. 40, fig. 10; Sowerby, in Reeve, Conch. Icon. xx, pl. 4, fig. 31, Clessin, in Conch.-Cab. 1886, p. 43, pl. 6, figs. 20-22, & p. 116, pl. 17, figs. 1, 2.

*Original description*:—Testa orbiculata, utroque latere depressa, sutus concaviuscula; anfractibus convexis, tenue striatis

obliquatis; apertura semi-lunari, obliqua, alba; colore externo fusco, subcorneo.

Shell greenish brown, finely ridged; spire rather flattened; whorls 3, last large; aperture angularly raised, then depressed, sloped, expanded below, rather produced; lower disc broadly concave.

Alt. 10·25, diam. maj. 20·5 mm. (fig. 10 in Conch Ind.).

Hab. India; Ceylon. (Generally diffused)

The *P. coromandelicus*, Kuster, described and figured by Sowerby in Reeve's 'Conchologia Iconica,' vol. xx, pl. 4, sp. 34, seems to be a synonym.

Var. *eburneus*, Gray, Sowerby, in Reeve, Conch. Icon. xx, pl. 5, sp. 38; Clessin, in Conch.-Cab. 1885, p. 226.

Shell high, tumid, undulating, smooth, white, banded with chestnut in the middle of the whorls; apex small; whorls 3, rather flattened above then sloped, inflated below; last large, high, rapidly increased; lower disc convex, apical whorl hidden; aperture large, flexuously depressed above, inflated below, produced. (*Sowerby in Reeve.*)

Diam. maj. 17, diam. min. 13·5 mm. (fig. 38 *b* in Conch. Icon.).

Hab. Ceylon.

Var. *brunneus*, Gray, Adams, Genera, ii, 1858, p. 261; Sowerby, in Reeve, Conch. Icon. xx, pl. 5, sp. 40; Clessin, in Conch.-Cab. 1885, p. 226.

Shell subglobose, high, smooth, ferruginous, spire small; whorls contracted above, raised, a little angular above the suture, then rounded, inflated in the middle; lower disc narrowly umbilicated; aperture semilunar, produced and expanded below. (*Sowerby in Reeve.*)

Alt. 8·25, diam. maj. 12·5 mm. (fig. 40 *b* in Conch. Icon.).

Hab. Bombay.

The following are the dimensions taken from Sowerby's figures in Reeve: alt. (excluding labrum) 6·5, diam. maj. 11·25, diam. min. 9; aperture: alt. (including labrum) 8, diam. 6 mm.

There can be little doubt that it is a small variety of *Pl. exustus*.

Var. *zonatus*, Dunker, in Conch.-Cab. 1884, p. 117, pl. 17, fig. 1.

Alt. 6½, diam. 16 mm.

Hab. Ceylon.

Appears to be irregularly transversely banded with purplish red.

## 228. *Planorbis zebrinus*, Dunker.

*Planorbis zebrinus*, Dunker, Conch.-Cab. 1850, p. 57, pl. 6, figs. 11-13.

*Original description*:—Pl. testa solida, straminea strigisque rufis

pecta, nitida denseque striata, haud pellucida, supera facie planiuscula, in medio profunde umbilicata, inferne concava; anfr.  $3\frac{1}{2}$ –4 tumidis, rotundatis infra prope suturam profundam subangulatis; apertura reniformi perparum obliqua; labro tenui fusco vel castaneo; lamella in pariete aperturali tenuissima.

Height 6·25, greatest diameter 16·25 mm.

*Hab* Pondicherry and the Coast of Coromandel.

A very doubtful species.

## 229. *Planorbis hindu*, Clessin.

*Planorbis hindu*, Clessin, Conch.-Cab. 1885, p. 224, pl. 33, fig. 9.

*Original description*:—Testa discoidea, depressa, leviter regulariterque striata, albidula, diaphana, nitida; supra infundibuliforme concava, infra concava; anfr. 4, modice celeriter accrescentes, depresso-rotundati, utrinque sutura modice profunda separati, inferne ad suturam vix obtuse angulati; ultimus amplus, penultimo duplo latior; apertura perobliqua, late-lunata; peristoma acutum, marginibus callo tenui conjunctis; margine superiore valde arcuate producto.

Alt. 4, diam. 11 mm.

*Hab*. India.

## 230. *Planorbis orientalis*, Lamarck.

*Planorbis orientalis*, Lamarck, Anim. s. Vert. vi [2], p. 153; Sowerby, in Reeve, Conch. Icon. xx, pl. 11, sp. 89; Clessin, in Couch.-Cab. 1885, p. 227.

*Original description*:—Pl. testa discoidea, utrinque plano-depressa, subrugosa, fragili, cornea; ultimo anfractu subangulato.

Shell thin, irregularly undulated, yellowish-white, sinistral; spire narrow depressed; whorls a little raised above the suture; last broad, sloped, expanded towards the aperture; aperture compressed above and below, large, obliquely deflected; margin sinuous; lower disc concave.

Lamarck in his original, though scanty, description, gives the diameter of the shell as 4 lines (= 9 mm.).

## 231. *Planorbis modicus*, Benson.

*Planorbis modicus*, Benson, Adams Genera, ii, 1858, p. 261; Sowerby, in Reeve, Conch. Icon. xx, pl. 9, sp. 76.

Shell horny, tumid, spire funnel-shaped; whorls 5, raised and angular near the suture, last broad, sloped, concentrically finely wrinkled; aperture subtrigonal, lower disc concave, whorls rather flat.

Diam. maj. 19·75, diam. min. 16·25 mm.

*Hab*. India.



232. *Planorbis merguiensis*, *Philippi*.

*Planorbis merguiensis*, *Philippi ubi* ?; H. & T., C. I. pl. 151, figs. 5, 6; Sowerby, *Conch. Icon.* xx, pl. 11, sp. 85; Clessin, *Conch.-Cab.* 1886, p. 140, pl. 12, figs. 26-28, & pl. 20, fig. 4.

Shell depressed, solid, striate, shining, pale horn-colour or brown; deeply umbilicate, slightly concave above; whorls 4, rapidly and regularly increasing, rounded; suture above deep, umbilical suture only lightly impressed; the last whorl twice as broad as the penultimate; aperture broadly semilunate, oblique; labrum acute, thickened.

Alt. 6, diam. 12 mm.

*Hab.* Mergui (Coll. Dunker legit Phil.); Chybassa, Bengal (var. *major*) (Coll. Dunker).

Section *GYRAULUS*.

*Gyraulus*, Agassiz, *Nouv. Mém. Soc. Helv.* i, 1837 (Hartmann, 1844).  
*Nautilina*, Stein, *Schnecken Berlin*, 1850, p. 50.

TYPE, *Planorbis albus*, Müller; Europe.

Range. World-wide.

Shell small, compressed, paucispiral; whorls rapidly increasing, the last broadening towards the aperture; aperture rather wide.

233. *Planorbis (Gyraulus) compressus* (*Hutton*).

*Planorbis (Gyraulus) compressus* (Hutton), J. A. S. B. iii, p. 91 (no. 13), 93; Benson, J. A. S. B. v, p. 743; Martens, *Mal. Blatt.* iv, p. 213; H. & T., C. I. pl. 99, figs. 1, 4; Sowerby, in Reeve, *Conch. Icon.* xx, pl. 14, fig. 118; Clessin, in *Conch.-Cab.* 1886, p. 107, pl. 16, fig. 10.

*Planorbis tondanensis*, Mouss., *Moll. Java*, p. 44, pl. 5, fig. 4.

Shell compressed, rather broad, pale, smooth, dextral, narrowed above, broad below, somewhat keeled, spire depressed; aperture obliquely pyramidal, angular above, lower margin produced. (*Sowerby in Reeve*.)

Alt. 3.5, diam. maj. 11.5 mm. (fig. 118 *a* in *Conch. Icon.*).

*Hab.* River Ganges, etc.

234. *Planorbis (Gyraulus) convexiusculus* (*Hutton*).

*Planorbis (Gyraulus) convexiusculus* (Hutton), J. A. S. B. xviii, pt. 2 (1849), p. 657; H. & T., C. I. pl. 99, figs. 8-10; Sowerby, in Reeve, *Conch. Icon.* xx, pl. 11, sp. 93; Clessin, *Conch.-Cab.* 1884, p. 127, pl. 17, fig. 9.

*Original description* :—Shell depressed,  $\frac{1}{4}$  of an inch in diameter; pale horn-colour; polished; closely and obliquely striate; whorls 4 or 5; rounded; suture well defined; periphery subangular, but

not influencing the aperture, which is ovato-lunate; umbilicus wide, discovering all the previous volutions; the whorls rising gradually and spirally from the horizontal, and rounded below.

Animal black or dusky.

*Hab.* Kandahar, plentiful in tanks; Quettah and the Kojuck Pass, in marshes, and along the marshlands of the River Helmund at Girishk (*Hutton*); Gangetic Provinces (*Tope Chancey*); Pinjore, below Simla (*Hutton*).

It differs from *Planorbis compressus* in wanting the delicate carina at the periphery and in having a lunate aperture without the angle on the middle of the outer lip; in being more convex, with rounder whorls; and in having its volutions wound round on a more open and less horizontal twist.

235. *Planorbis (Gyraulus) labiatus* (*Benson*).

*Planorbis (Gyraulus) labiatus* (Benson), A. M. N. H. ser. 2, v, 1850, p. 350

*Original description*:—Testa solidiuscula, plano-depressa, nitida, albido-cornea, subdiaphana, oblique arcuato-striata, striis remotiusculis spiralibus decussata; apice profunde concavo; sutura profunda; anfr.  $3\frac{1}{2}$ , cito crescentibus, convexis, ultimo antice majori, ab axe superiorum discedenti, rotundato, carina mediana levissima submembranacea instructo, infra valde convexo; umbilico subaperto profundiori, margine interiori subangulato; apertura obliqua, cordiformi, intus albo-labiata; margine superiori arcuato, inferiori rotundato.

Alt. scarcely 2, diam. maj. 5, diam. min. 4 mm.

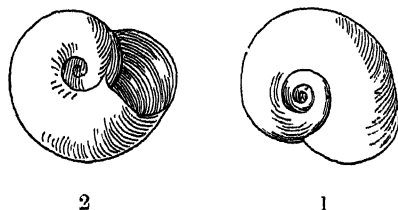


Fig 5.—*Planorbis (Gyraulus) labiatus*, Bens. (Types.)

1, spire, 2, base of shell.  $\times 4$ .

*Hab.* Moradabad (found among specimens of *Planorbis compressus*, *Hutton*).

"This little shell is remarkable for the departure of the last whorl from the axis which governs the previous volutions. This is especially apparent underneath, where the earlier whorls in the umbilicus proceed regularly, the last whorl becoming suddenly excentric. The whitish rib within the lip is also a marked character, as well as the proportion of the axis to the diameter."

236. *Planorbis (Gyraulus) sivalensis* (Hutton).

*Planorbis (Gyraulus) sivalensis* (Hutton, MS.), Clessin, in Conch.-Cab. 1884, p. 194, pl. 28, fig. 9.

*Original description*:—Testa minuta, compressa, solidula, pallide-cornea, subtilissime striata, nitidula; supra centro immerso, infra concava; anfr.  $3\frac{1}{2}$ –4, lente et regulariter accrescentes, superne convexiusculi, sutura profunda separati, inferne subplanulata; ultimus infra obtuse angulatus, penultimo vix duplo latior; apertura ovata, perobliqua; peristoma acutum, marginibus, callo tenuissimo conjunctis.

Alt. 1.2, diam. 4.5 mm.

*Hab.* N. India, Dehra Dun (Benson).

237. *Planorbis (Gyraulus) hohenackeri* (Clessin).

*Planorbis (Gyraulus) hohenackeri*, Clessin, in Conch.-Cab. 1884, p. 205, pl. 31, fig. 7.

*Original description*:—Testa solidula, diaphana. leviter et regulariter costulata, fulvo-cornea, supra profundissime perforata, infra parum concava; anfr.  $3\frac{1}{2}$  celerrime accrescentes, teretes, utrinque sutura profunda separati; ultimus  $\frac{1}{3}$  omnis diametri superans, ad aperturam breve descendens; apertura lunata, rectum; peristoma acutum, fusco-labiatum; marginibus callo tenui junctis.

Alt. 4.5, diam. 9 mm.

*Hab.* Himalayas.

238. *Planorbis (Gyraulus) huttoni* (Benson).

*Planorbis (Gyraulus) huttoni* (Benson, MS.), Clessin, in Conch.-Cab. 1884, p. 139, pl. 18, fig. 4.

*Original description*:—Testa parvula, depressa, tenuis, transverse striata, pallide-cornea, supra plana centro immerso, subtus modice umbilicata; anfr.  $3\frac{1}{2}$ , celerrime accrescentes, ovato-depressi, sutura profunda separati, ultimus valde dilatatus, penultimo triplo latior; aperturam versus paululum descendens; apertura ampla, valde obliqua; peristoma acutum, margine superiore producto.

Alt. 1, diam. 5.5 mm.

*Hab.* Calcutta; Benares.

239. *Planorbis (Gyraulus) barrackporensis* (Clessin).

*Planorbis (Gyraulus) barrackporensis*, Clessin, Conch.-Cab. 1884, p. 125, pl. 18, fig. 7.

*Original description*:—Testa depressa, supra paulo convexiuscula, centro immerso; infra umbilicata; subtiliter striatula, diaphana, tenuis, paulo nitidula, pallide-cornea; anfr.  $3\frac{1}{2}$ , ovato-rotundati, utrinque æqualiter convexiusculi, angulati; celerrime

acrescentes; ultimus penultimo fere tertio latior; apertura valde obliqua, ovata; peristoma acutum, margine superiore valde producto, arcuato.

Alt. 1·2, diam. 4 mm.

Hab. Barrackpore.

240. *Planorbis (Gyraulus) himalayanus* (Hutton).

*Planorbis (Gyraulus) himalayanus* (Hutton, MS.), Clessin, Conch.-Cab. 1884, p. 141, pl. 20, fig. 8.

*Original description*.—Testa depressa, solidula, nitidula, pellucida, arcuate striata; supra plauulata centro concavo; subtus paululum concava; anfr. 4, modice celeriter accrescentes, depresso-ovati, sutura leviter immersa separati, in peripheriam fere angulati, utrinque æqualiter convexiusculi; ultimus penultimo duplo latior; apertura perobliqua, ovata; peristoma acutum, marginibus disjunctis, margine superiore arcuata producto, inferiore fere recto.

Alt. 1·2, diam. 5·5 mm.

Hab. Tinjori Valley.

241. *Planorbis (Gyraulus) liratus*, *Westerlund*.

*Planorbis (Gyraulus) liratus*, *Westerlund*, in Vega Exped. Vetenskapliga Jakttagelser, iv, p. 206, pl. 4, fig. 18.

*Original description*.—Testa parva, plana, utrinque centro subæqualiter impressa, lutescenti-cornea, supra et infra, ab apice ad aperturam sub lente perdistincte spirali lineata, transversim vix striatula; anfr. 4, convexi, regulariter accrescentes, ultimus lente accrescens, subcylindraceus, basi perobsoleto angulatus, supra paullo magis convexus; apertura rotundata.

Alt. 1, diam. 2·5 mm.

Hab. Point de Galle, Ceylon.

242. *Planorbis (Gyraulus) demissus*, *Westerlund*.

*Planorbis (Gyraulus) demissus*, *Westerlund*, in Vega Exped. Vetenskapliga Jakttagelser, iv, p. 204, pl. 4, fig. 16.

*Original description*.—Testa depressa, utrinque centro impressa (supra magis), striatula, sculptura spirali nulla, angulo peripherico distincto, juvenis cornea, nitidula, matura alba, opaca; anfr. 4½, celeriter sed sæpius (præsertim subtus) irregulariter accrescentes, utrinque magis magisque centrum versus demissi, ultimus dilatatus, medio angulatus, utrinque subæqualiter convexiusculus, antice paullo descendens; sutura sat profunda; apertura perobliqua, intus semper nitida, ovata, extus acutiuscula, marginibus callo elato in pariete contiguis, interiore leviter curvato, exteriori forte arcuato.

Alt. 1·5, diam. maj. 6, diam. min. 5 mm.

Hab. Point de Galle, Ceylon.

243. *Planorbis* (*Gyraulus*) *associatus*, *Westerlund*.

*Planorbis* (*Gyraulus*) *associatus*, *Westerlund*, in *Vega Exped. Vetenskapliga Jakttagelser*, iv, p. 205, pl. 4, fig. 17.

*Original description*:—Testa depressa, supra plana, centro vix impressula, subtus late convexiuscula (anfractus ultimus circumcirca altior et spira sensim profundior), striatula, nitidula, cornea; anfr. 5, lente accrescentes, primi convexi, cæteri convexiusculi, sutura sat profunda disjuncti, ultimus sensim latior, non dilatatus, periphæria obsolete angulatus, utrinque subæqualiter convexiusculus; apertura obliqua, ovato, peristomate subincrassato.

Alt. 1·5, diam. 5·5–6·5 mm.

*Hab.* Point de Galle, Ceylon.

Almost certainly a variety of *P. (G.) demissus*.

244. *Planorbis* (*Gyraulus*) *elegantulus* (*Dohrn*).

*Planorbis* (*Gyraulus*) *elegantulus* (*Dohrn*), *P. Z. S.* 1858, p. 134; *H. & T., C. I.* pl. 151, figs. 1–3.

*Original description*:—Testa discoidea, albida sub lente tenuiter striata, nitida, pellucida, supra convexiuscula, umbilicata, subtus plana; anfr. 4–5 lente accrescentes, ultimus infra medium obsolete carinatus; apertura perobliqua, sublunaris; peristomium rectum, intus calloso-albo-labiatum.

Diam. maj. 4·75, diam. min. 4 mm.

Aperture: alt. 1 mm.

*Hab.* Ceylon.

245. *Planorbis* (*Gyraulus*) *nanus* (*Sow.*).

*Planorbis* (*Gyraulus*) *nanus* (*Sow.*), *Sowerby*, in *Reeve, Conch. Icon.* xx, pl. 9, sp. 75; *Benson, P. Z. S.* 1856, p. 186.

Shell pale fulvous, compressed, rather convex above, broadly and deeply umbilicated below; spire narrow, flat; whorls 3, obliquely striated, rapidly increased, last very broad; aperture depressed, very broad, outer lip obliquely produced above. (*Sowerby in Reeve.*)

Diam. maj. 11, diam. min. 10 mm. (fig. 75 a in *Conch. Icon.*).

*Hab.* India; subfossil, Tsoral Lake, Tibet (*Captain H. Strachey*).

246. *Planorbis* (*Gyraulus*) *rotula* (*Benson*).

*Planorbis* (*Gyraulus*) *rotula* (*Benson*), *A. M. N.* II. ser. 2, v, 1850, p. 351; *H. & T., C. I.* pl. 90, figs. 2, 3.

*Original description*:—Testa minuta, depresso-planata, apertissime umbilicata, luteo-cornea, diaphana, impolita, spiraliter obsolete striata; anfr. 3½, cylindræcis, lente horizontaliter incrementibus, supra et subtus æqualiter apparentibus; ultimo ad periphærium rotundato, nullo modo angulato: sutura supra infraque profunde impressa; umbilico minime profundo; apertura vix obliqua, rotundato-lunata; margine superiori arcuato.

Alt. 1, diam. maj. 2.66, diam. min. 2 (about) mm.

*Hab.* Moradabad.

The figures and description given by Sowerby in Reeve's 'Conchologia Iconica,' vol. 20, and copied by Clessin in the 'Conchylien-Cabinet,' 1885, obviously can have nothing to do with Benson's species.

247. *Planorbis (Gyraulus) stelzneri* (Dohrn).

*Planorbis (Gyraulus) stelzneri* (Dohrn), P. Z. S. 1858, p. 134; H. & T., C. I. pl. 91, figs. 4, 7; Clessin, in Conch.-Cab. 1884, p. 117, pl. 11, fig. 11.

*Original description*:—Testa discoidea, albido-cornea, tenuiter longitudinaliter striata, nitida, pellucida, supra plana, subtus paullo convexior, utrinque foveolata; anfr. 3-4 vix convexi, ultimus acute carinatus; apertura perobliqua, sublunaris; peristomium rectum, intus albolabiatum.

Diam. maj. 7, diam. min. 5.5 mm.

Aperture: alt. 1 mm.

*Hab.* Ceylon.

248. *Planorbis* (? *Gyraulus*) *hyptiocyclos* (Benson).

*Planorbis* (? *Gyraulus*) *hyptiocyclos* (Benson), A. M. N. H. ser. 3, xi, 1863, p. 89, & Pfeiffer, Mon. Helic. v, p. 117 (as *Helix*); H. & T., C. I. pl. 99; Sowerby in Reeve, Conch. Icon. xx, pl. 14, fig. 120; Clessin, in Conch.-Cab. 1885, p. 228.

*Original description*:—Testa latissime umbilicata, orbiculato-planata, planorbiformi, depressa, fragili, oblique striatula, translucida, polita, olivaceo-cornea; spira concaviuscula, apice foveolato, suturis profundis; anfr. 4½, gradatim incrementibus, utrinque convexis, ultimo convexiusculo, peripheria subcarinata; apertura valde obliqua, elliptico-lunata; peristomate tenui, acuto, marginibus conniventibus, callo tenui junctis.

Alt. 1.5, diam. maj. 6, diam. min. 5 mm.

*Hab.* Fort MacDonald, Ceylon (Province of Uva) (*F. Layard*).

Clessin (Nachr. Bl. Malak. Ges. xxxix, 1907, p. 7) reports *Pl. (Tropidiscus) marginatus*, Drap. var. *submarginatus*, Jan, and *Pl. (T.) carinatus*, Müll. from the Pamirs, together with the following two species described by him at the same time, without figures.

249. *Planorbis (Gyraulus) acutus*, Clessin.

*Planorbis (Gyraulus) acutus*, Clessin, Nachr. Bl. Malak. Ges. xxxix, 1907, p. 7.

Shell flattened, whorls 4, very rapidly increasing, the last one-third of the total diameter of the shell, whorls very compressed, in section almost lancet-shaped; sharply keeled, more convex above the keel than below; suture slightly impressed; finely sculptured; umbilicus wide; aperture very oblique, compressedly ovate.

Alt. 1.5, diam. 7 mm.

*Hab.* Pamirs, numerous but very local.

250. *Planorbis (Gyraulus) issykulensis*, Clessin.

*Planorbis (Gyraulus) issykulensis*, Clessin, Nachr. Bl. Malak. Ges. xxxix, 1907, p. 7.

Shell small, slightly compressed, whorls 4, rapidly increasing (the last scarcely one-third of the total diameter of the shell); suture moderately deep; umbilicus rather wide; sculpture fine, irregular; aperture oblique, compressedly ovate.

Alt. 1.2, diam. 4.5 mm.

*Hab.* Pamirs, from only one locality, but very plentiful.

Section *HIPPEUTES*.

*Hippeutes*, Agassiz, Nouv. Mém. Soc. Helv. i, 1837.

TYPE, *Planorbis fontanus*, Lightfoot; Europe.

Range. Europe; Asia.

Shell small, lenticular, much depressed, paucispiral; whorls very rapidly increasing, carinate; aperture obliquely heart-shaped.

251. *Planorbis (Hippeutes) versicolor*, Westerlund.

*Planorbis (Hippeutes) versicolor*, Westerlund, in Vega Exped. Vetenskapsliga Jakttagelser, iv, p. 206, pl. 4, fig. 19.

*Original description*:—Testa juvenis rufo-castanea, nitidissima, adulta rufescenti-cornea, nitidula, subtilissime oblique striatula, supra convexa, centro sat profunde immersa, subtus planiuscula, umbilicata (umbilico centro angustissimo, aperturam versus dilatato) striatula; anfr. 4, primi angusti, spiram minimam formantes, ultimus maximus, extus declivis, subtus convexiusculus, peripheria acute angulatus; apert. perobliqua, cordiformis, margine columellari subrecto, exteriore antrorsum valde convexo.

Alt. 1.5, diam. 5 mm.

*Hab.* Point de Galle, Ceylon.

Subgenus *SEGMENTINA*.

*Segmentina*, Fleming, Hist. Brit. Anim. 1828, p. 270.

TYPE, *Planorbis nitidus*, Müller; Europe.

Range. Europe; Asia; Africa; Australia.

Shell orbicular, depressed, furnished internally with transverse, testaceous partitions or teeth; aperture transversely oval, or circular.

See also description of *Planorbis*, p. 115.

252. *Planorbis (Segmentina) umbilicalis* (Benson).

*Planorbis (Segmentina) umbilicalis* (Benson), J. A. S. B. v, 1836, p. 741; A. M. N. H. ser. 2, v, 1853, p. 351; Martens, Mal. Blatt. xiv, p. 216; H. & T., C. I. pl. 40, figs. 7-9; Sowerby in Reeve, Conch. Icon. xx, pl. 10, fig. 77; Clessin, in Conch.-Cab 1884, p. 136, pl. 15, fig. 6

*Original description*:—Testa quasi dextra luteo-cornea, polita, leviter radiato-striata, infra excavato-depressa, anfractibus omnibus versus umbilicum profundum spectantibus, ultimo interiores pene tegente; supra convexa versus apicem planata, apice concavo, omnibus anfractibus satis apparentibus; periphæria obtuse angulata.

The dimensions as given by Clessin are as follow:—

Alt. 2, diam. 8.5 mm.

*Hab.* Sylhet.

253. *Planorbis (Segmentina) trochoideus* (Benson).

*Planorbis (Segmentina) trochoideus* (Benson), J. A. S. B. v, 1836, p. 742 (Glean. Scien. Calcutta, i, pl. 8, fig. 10); A. M. N. H. ser. 2, v, 1850, p. 352; H. & T., C. I. pl. 39, figs. 4-6; Sowerby in Reeve, Conch. Icon. xx, pl. 9, fig. 70; Clessin, in Conch.-Cab. 1885, p. 225.

*Original description*:—Testa quasi dextra diaphana, subtrochiformi, supra glabra, rotundato-convexa, apice concavo-depresso quasi umbilicali; anfractibus omnibus parum apparentibus, sutura excavata divisis; infra radiatim striata, truncata, planata, umbilico contracto. Anfractu ultimo majori reliquos amplectente, supra pene, infra omnino obtegente; periphæria acuta.

Alt. scarcely 2, diam. 3 mm.

*Hab.* Barrackpore.

254. *Planorbis (Segmentina) gruneri* (Clessin).

*Planorbis (Segmentina) gruneri* (Clessin), in Conch.-Cab. 1884, p. 148, pl. 21, fig. 9.

*Original description*:—Testa depressa, supra centro paululum concavo, subtus subplanata, nitidula subtilissime irregulariter striata, diaphana, cornea; anfr.  $4\frac{1}{2}$  lente et regulariter accrescentes, depresso-ovati, utrinque convexiusculi ac sutura profunda separati; ultimus penultimo vix duplo latior; apertura obliqua, ovata; peristoma acutum, marginibus disjunctis; margine superiore paululum producto.

Alt. 8, diam. 5 mm.

*Hab.* India; Singapore.



255. *Planorbis (Segmentina) spirodelus*, *Westerlund*.

*Planorbis (Segmentina) spirodelus*, *Westerlund*, in *Vega Exped.*  
*Vetenskapliga Jakttagelser*, iv, p. 209, pl. 5, fig. 21.

*Original description*:—Testa flavescenti-cornea (anfr. prioribus rufis), supra convexa, medio impressa, subtus plana, concaviuscula, latiuscule umbilicata; anfr. 5, primi lente, ultimi regulariter accrescentes et diameter penultimi ad aperturam perfecte duplo minor quam reliqua spira et spira tota magna, latitudine anfractum ultimum ad aperturam multo superans; anfr. ult. convexus, extus lente descendens, basi sat acute angulatus, antice non dilatatus; apertura descendens, valde obliqua, forte lunata, obtuse cordata, margine columellari subrecto, exteriori valde arcuatim producto; faux pluries lamellis 3 albis coarctata.

Alt. 1·25, diam. 4·5 mm.

*Hab.* Point de Galle, Ceylon.

256. *Planorbis (Segmentina) indicus (Benson)*.

*Planorbis (Segmentina) indicus* (*Benson*), *A. M. N. H.* 1850  
 p. 350; *H. & T., C. I.* pl. 40, figs. 4-6.

*Original description*:—Testa minuta, perforata, sublenticulari, albida, lævi, subdiaphana, supra convexa; spira planulata, apice depresso; anfr. 2½, ultimo medio obtuse angulata, subtus convexo; apertura cordata, obliqua, margine superiori arcuato, prominente, inferiori recedente.

Alt. ·66, diam. 2·5 mm.

*Hab.* Upper Sind.

257. *Planorbis (Segmentina) cantori (Benson)*.

*Planorbis (Segmentina) cantori* (*Benson*), *A. M. N. H.* ser. 2, v,  
 1850, p. 349; *H. & T., C. I.* pl. 40, figs. 1-3; *Sowerby*, in *Reeve*,  
*Conch. Icon.* xx, pl. 10, fig. 79; *Clessin* in *Conch.-Cab.* 1884,  
 p. 158, pl. 23, fig. 9.

*Original description*:—Testa nitidula, cornea, subdiaphana, radiato-striata, depressa, supra convexiuscula, spira planata, apice concavo, sutura bene impressa; anfr. 5½, convexiusculis, lente crescentibus, ultimo antice majori, subtus convexo, periphæria subcarinata; umbilico aperto, profundiusculo; apertura obliqua subcordiformi, margine supra valde arcuato, fuscato, infra leviter rotundato.

Alt. 2, diam. maj. 7, diam. min. 6·25 mm.

Diam. spiræ 3·5; lat. anfract. ult., antice, 3 mm.

*Hab.* Barrackpore.

258. *Planorbis (Segmentina) calathus* (Benson).

*Planorbis (Segmentina) calathus* (Benson), A. M. N. H. ser. 2, v, 1850, p. 348; H. & T., C. I. pl. 34, figs. 1-3; Sowerby, in Reeve, Conch. Icon. xx, pl. 4, fig. 30; Clessin in Conch.-Cab. 1884, p. 136, pl. 15, fig. 13.

*Original description*.—Testa nitidiuscula, albido-cornea, vel lutescente cornea, subdiaphana, exiliter radiato-striata, supra convexa, versus apicem planulata, apice concavo, sutura impressa; anfr. 4, ultimo extus depresso, inferne angulato, intus laminis denticulisque radiatis frequentioribus munito, subtus subplanato, versus umbilicum angustum, profundum excavato; apertura obliqua, cordato sagittata intus remote labiata, margine superiori arcuato, prominente, inferiori subrecto, recedente.

Alt. 2, diam. maj. 4·66, diam. min. 4 mm.

*Hab.* Bhimtal and Neini Tal, in the Kemaon Region of the Himalayas; Moradabad; Kattiawar; Ceylon; Kashmir, etc.

Apparently very local, but abundant where found.

259. *Planorbis (Segmentina) cænosus* (Benson).

*Planorbis (Segmentina) cænosus* (Benson), A. M. N. H. ser. 2, v, 1850, p. 349; H. & T., C. I. pl. 39, figs. 7, 8; Sowerby, in Reeve, Conch. Icon. xx, pl. 10, fig. 78; Clessin, in Conch.-Cab. 1884, p. 165, pl. 24, fig. 4.

*Original description*.—Testa nitida, luteo-cornea vel olivaceo-cornea, oblique et rude (præcipue subtus) radiato-striata, subdiaphana, supra depresso-convexa; spira parvula, apice excavato; sutura impressa; anfr.  $3\frac{1}{2}$ , ultimo majori, extus depressiusculo, inferne carinato, subtus planato, versus umbilicum majorem leviter excavato; apertura obliqua, sagittiformi, margine superiori arcuato, prominente inferiori recedente, recto.

Alt. 1·5, diam. maj. 6, diam. min. 5 mm.

*Hab.* Moradabad; Ceylon.

Differing from *P. (S.) calathus* in having no internal laminæ and in being more depressed and more angular at the keel; moreover the relative dimensions are not the same.

## Family PHYSIDÆ.

## Subfamily PHYSINÆ.

Shell fusiform or ovately fusiform, sinistral, horny.

*Distribution.* World-wide.

## Genus PHYSA.

*Physa*, Draparnaud, Tabl. Moll. France, 1801, p. 52, & Hist. Nat. Moll. Terr. Fluv. France, p. 54.

*Bulla*, Linnæus, etc.  
*Planorbis*, Muller.  
*Turbo*, Costa.  
*Bulmus*, Bruguière, Poiret.  
*Limnea*, Sowerby.

TYPE, *Physa fontinalis*, Linn.; Europe.

Range. Europe; Asia; Africa; America.

Shell fluviatile, horny, thin, spiral, sinistral, generally ovate acuminate; outer lip sharp, simple, inner lip expanded, continuous with the columella; columella tortuous, single-plated.

260. *Physa coromandelica*, Dunker.

*Physa coromandelica*, Dunker, Malak. Blatt. 1862, p. 150.

*Original description* :—Testa subovata tenuis, fusco-cornea, subdiaphana, anfractibus quinque carinatis, per longitudinem striatis, sutura distincta divisim instructa; spira parum exserta, ob carinam prominentem scalata; anfractus embryonalis vel apex obtusiusculus; apertura ovato-oblonga obliqua; spira duplo major; labrum acutum in margine superiore angulatum.

Alt. 11, diam. 5.5 mm.

*Hab.* Coromandel.

## Class PELECYPODA.

### Order TETRABRANCHIA.

#### Suborder MYTILACEA.

#### Family ARCIDÆ.

##### Subfamily ARCINÆ.

Shell either equivalve or inequivalve, oval, rounded or trapezoidal, covered with a periostracum; ligament spreading over a considerable external area, or confined to a small depression; hinge multi-dentate, the teeth short or lamelliform; adductor scars extended, subequal; pallial line simple; interior of shell not nacreous.

Animal, with the exception of *Scaphula*, marine; foot large, broad, bearing a byssiferous groove and frequently a byssus; the adductor muscles in both valves of about equal size; siphons absent; gills oblique, either equal or unequal; palpes simple without posterior appendages.

*Distribution.* Tropical and subtropical seas, and rivers of Eastern India and Burma far beyond the limits of tide.

Genus **SCAPHULA.**

*Scaphula*, Benson, P. Z. S. 1834, p. 91; Zool. Journ. v, 1835, p. 464; A. M. N. H. ser. 2, xvii, 1856, p. 128.

**TYPE**, *Scaphula celox*, Benson; River Jumna, near Bundelkund.

**Range.** Rivers of India and Burma.

The original description of the genus is as follows:—

“The form of the shell, its lozenge-shaped ligamental scar, and the position and order of its teeth shew its place to be among the *Arcaceæ*; while the oblique production of the teeth on the posterior side down the inner surface of the cardinal lamina, the separation of the teeth into two sets by the interposition of an edentate portion of the cardinal lamina, and the freedom of the shell from ribs, with the exception of the ridges which occur at the angle of the shell, will suffice to distinguish our shell from the genus *Arca*, which will still comprehend marine shells only.”

In 1856 in the ‘Annals and Magazine of Natural History,’ p. 128, Benson gives an amended description of the above as follows:—“Testa æquivalvis, valde inæquilateralis, subtrapeziformis, carina valida ab umbonibus distantibus usque ad marginem posteriorem et basalem extendente; cardo rectilinearis, medio tenuis, ad extremitates sulcidentatas latior, dentibus anterioribus 4, crenulatis minutis obliquis posterioribus lamellatis, parallelibus, intus oblique descendentibus, 4 ad 6, primo obliquis, demum transversis, raro bifurcatis, munita; ligamentum exterius, rhombiforme, inter umbones situm; epidermis tenuis vel crasse lamelloso-rugosa; muscoli adductoris impressio antica unica, posteriores duæ subdistantes quorum inferior oblongo-quadrata; pallii impressio integra.”

“The genus is at once distinguished from its nearest allies, *Arca* and *Cucullæa*, by the hinge being linear and edentate in the middle and for the greatest part of its length, and by the form and position of the teeth at the extremities; the laminar posterior ones, which are sometimes ramose, running obsoletely and obliquely into the interior of the shell. The two distinct adductor muscular impressions, and the squareness of the lower one on the posterior side in both species, are peculiar features supporting the claims of the type to generic distinction.”

The animal is unknown.

## 261. *Scaphula celox*, Benson.

*Scaphula celox*, Benson, J. A. S. B. v, 1836, p. 750 (as figured in Glean. Science, Calcutta), i, pl. 7, figs. 2, 3; A. M. N. H. xvii, 1856, p. 129; Blanford, J. A. S. B. xxxvi, pt. 2, pl. 14, figs. 14, 15; H. & T., C. I., 1876, p. 47, pl. 116, figs. 8, 9; Crosse & P. Fischer, J. Conchyliol., Paris, xxiv, p. 339.

*Arca scaphula*, Benson, P. Fischer, Man. Conch., p. 976.

*Scaphula celox*, Benson, Lamy, J. Conchyliol., Paris, 1907, lv, pp. 109-111.

*Original description*:—Testa elongata, tumida, læviuscula antice angulata, inter umbonem extremitatemque anticam subito evasa; carino umbonali compresso, costula obsoleta contigua.

\* As Benson gave no dimensions, the following are taken from three specimens in the British Museum.

	1.	2.	3.
Long. ....	3·5	3·25	4·5 mm.
Lat. ....	10·75	11·75	11·5 mm.
Diam. ....	6	6	7·75 mm.

*Hab.* River Cane, near Banda, Bundelkund.

## 262. *Scaphula pinna*, Benson.

*Scaphula pinna*, Benson, A. M. N. H. ser. 2, xvii, 1856, pp. 128-129; Blanford, J. A. S. B. xxxvi, pt. 2, pl. 14, figs. 11-13; H. & T., C. I. 1876, p. 47, pl. 116, figs. 5-6.

*Original description*:—Testa elongato-triangulari, subtrapeziformi, extus sub epidermide albida, intus cærulescente, antice angusta, extremitate subacute angulata, arcuatim descendente postice, subalata, expansa, extremitate superne arcuata, infra rectangulari; carina acuta, compressa; pagina postica majori subremote, antica confertim concentricè sulcata, utrinque radiatim striatula; epidermide fusco-nigra, crasse rugoso-lamellata, marginem nigrescentem excedente, musculi anterioris impressione ovato-rotundata, posterioribus duabus, superiori subcardinali elongata, angusta, inferiori elongato-quadrata.

Long. 5, lat. 11, diam. 6 mm.

Three specimens in the British Museum, received from the late Dr. Blanford, are of the following dimensions.

	1.	2.	3.
Long. ....	3·5	3	2·25 mm.
Lat. ....	9·5	8·25	6·5 mm.
Diam. ....	4·25	4·25	3·25 mm.

*Hab.* Tenasserim River.

## 263. *Scaphula deltæ*, Blanford.

*Scaphula deltæ*, Blanford, J. A. S. B. xxxvi, pt. 2, pp. 71-72, pl. 14, figs. 7-10; Cont. Ind. Mal. pt. 8, p. 21, pl. 3, figs. 7-10; H. & T., C. I. 1876, p. 47, pl. 116, figs. 2 & 3.

*Original description*:—Testa tumida, perelongato-rhomboidea, sub epidermide crassa, fusca, postice radiatim lirata albida, lineis minutus elevatis confertissimis decussata, ante carinam costa

unica lata, planulata, aliquando obsoleta, a natibus ad marginem decurrente, munita, intus cærulescens, antice rotundata, postice oblique truncata, margine ventrali antice convexa, postice vix concaviuscula (testæ junioris recta). Carina perelevata, acuta, valvas in paginas duas dividens, antica tumida, postica concava. Area nitida, sub lente striatula, ligamento rhombeo solum antice induta. Dentes cardinales postici breves, obliqui, ab extremitate remotiusculi.

	1.	2.
Long. ....	3·5	3 mm.
Lat. ...	10	8 mm.
Diam. . . . .	6·5	5 mm.

*Hab.* Irawady River at Pegu; found "under stones in creeks, adhering by a byssus"; Mahanadi River, at a point five miles above Sambalpur, Orissa (Chaudhuri).

The author appends the following notes to his description:—"Shell very tumid, elongately rhomboidal (the ventral and dorsal margins being parallel as in *S. celox*), covered with a thick dark epidermis, which is rather rough and radiately ribbed behind the keel. Beneath the epidermis the shell is white, and decussately very minutely sculptured, one flat broad rib, scarcely raised, and occasionally obsolete in old specimens, passing from the umbones to the margin just in front of the keel. This is scarcely distinguishable until the epidermis is removed. The valves are bluish within, rounded in front, obliquely truncated at the posterior margin; the ventral margin is convex anteriorly, subconcave posteriorly, being straight for the greater part of its course in young shells, but becoming slightly concave, at the spot where the byssus passes out, in old specimens. The keel is very high and sharp, separating the valves into two subdivisions, the anterior of which is tumid, the posterior concave. The area is polished and striated rather obliquely, the ligament diamond-shaped and covering only the anterior portion, about  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the area. The hinge teeth are oblique, but less so than in either *S. celox* or *S. pinna*, and the posterior teeth are much farther from the extremity of the shell than in either of those species."

"The great distinction between this species and the other two previously described is in the far greater tumidity of the valves, which are nearly twice as broad in their diameter from side to side (of the closed valves) as they are from the dorsal to the ventral margin. The proportion of the two diameters in the present species averages about 12:7. In *S. celox* it is 12:10 $\frac{1}{2}$  and in *S. pinna* 12:9 $\frac{1}{2}$ ."

Suborder *SUBMYTILACEA*.

## Family UNIONIDÆ.

## Subfamily UNIONINÆ.

Shell nacreous, covered with a more or less thickened periostracum; umbones generally corrugatedly sculptured; ligament somewhat elongated, projecting; hinge teeth bearing, the teeth usually strong, arranged as cardinals and laterals; pallial line generally simple. Animal with labial palpes somewhat drawn out, projecting posteriorly; embryos borne in the outer or in all four gills.

*Distribution.* Temperate and tropical regions of the world. A single genus occurring in the Indian Region.

Genus *SOLENAIA*.

*Solenaia*, Conrad, Am. Journ. Conch. iv, 1869, p. 249.

*TYPE*, *Mycetopus emarginatus*, Lea, from Siam.

*Range.* South-Eastern Asia and China, one species only from India.

Shell elongated, thin; gaping anteriorly; hinge with a long, acicular, lateral tooth in each valve, slightly developed.

The soft parts appear to be unknown, though Fischer notes in his paper 'Observations sur les genres *Mycetopus* et *Solenaia*'\* that the animal retains an upright position in a hole which it bores in the earth, which is often very hard, the manner of boring being unknown. The siphons are placed above, the valves gaping apart, the foot is turgescent having the anterior extremity much swollen in the form of a bowl.

264. *Solenaia soleniformis* (Benson).

*Solenaia soleniformis* (Benson), Simpson, Syn. Naiades, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 656.

*Anadonta soleniformis*, Benson, J. A. S. B. v, 1836, p. 750.

*Margaron (Unio) bensoni*, Lea, Syn. 1870, p. 57.

*Mycetopus bensonianus*, Lea, H. & T., C. I. 1876, pl. 9, fig. 1; Pætel, Conch. Sam. iii, 1890, p. 186.

*Spatha soleniformis*, Fischer, J. Conchyliol., Paris, xxxviii, 1890, p. 94.

*Original description*:—Testa elongatissima, postice angustata, extremitate rotundata: antice latiore, sub-alata, extremitate

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\* J. Conchyliol., Paris, xxxviii, 1890, p. 11.

oblique truncata: natibus complanatis, inconspicuis, senectate oblitteratis, decorticatis; epidermide junioris fulvida, præter angulum umbonis viridi, sulcis illuc vinis impressa, ætate fusca.

Long. 150, lat. prope apicem 30, lat. prope alam 37·5 mm.

Benson adds the following note to his description:—

"This is a very interesting shell, being, in proportion to its length, the most elongated of the genus. The pearl of the

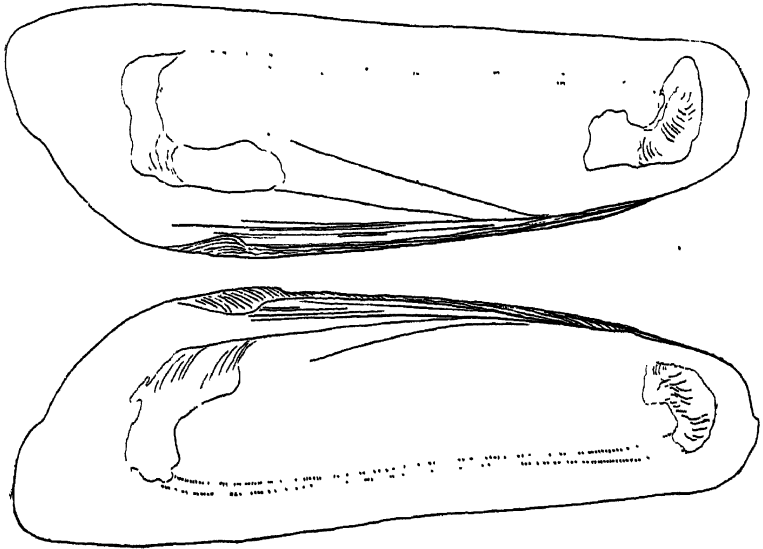


Fig. 6.—*Solenasa soleniformis* (Benson) (specimen), nat. size, showing pallial line and muscular scars.

interior is bluish with a salmon tinge in old specimens, which are likewise much worn on the exterior surface, and have their posterior muscular impression very deeply marked, and, as it were, carious. The anterior muscular impression is considerably elongated under the transverse direction."

*Hab.* Assam.

There is a good series of this species in the Indian Museum Collection, all from Cachar, of which the measurements of three specimens are:—

	1.	2.	3.
Long. ....	55	45·5	49·5 mm.
Lat. ....	183	191	207 mm.
Diam .....	29·75	25·75	27·75 mm.



## Subfamily HYRINÆ.

Male and female shells alike, with beak sculpture radial or zigzag-radial; marsupium occupying the inner gills only.

*Distribution.* Southern and Eastern Asia; Malay Archipelago; Solomon Islands; Australia; New Zealand; Tasmania; South America; and Africa. Several of the genera are found in the Indian Region.

## Genus UNIO.

*Unio*, Retzius, Diss. Hist. Test. Gen. 1788, p. 16; Bruguière, Choix de Mémoires, i, 1792, p. 106.

*Limnæa*, Poli (pars), Test. utr. Sic. i, 1791, p. 31.

*Lymnium*, Oken, Lehrbuch, 1815, p. 237.

*Elliptio*, Rafinesque, J. de Phys. et Hist. Nat. 1819, p. 426.

*Mysca*, Turton, Conch. Ins. Brit. 1822, p. 243.

*Canthyria*, Swanson, Tr. on Mal. 1840, p. 278.

*Unio merus*, Conrad, Proc. Acad. Nat. Sci. Philadelphia, vi, 1853, p. 268.

TYPE, *Unio tumidus*, Retzius, from Northern and Central Europe, Siberia.

*Range.* Europe, Siberia, Asia Minor, Assyria, N. Africa, and a single species recorded from Kashmir.

Shell inequilateral, ovate or elongate, generally cuneate, ridged with concentric growth-lines; umbones moderately large, generally corrugately sculptured; hinge possessing one pseudocardinal and one lateral tooth in the right valve and two pseudocardinals and two laterals in the left valve; umbonal cavity shallow.

The following description of the animal is taken from Simpson's work on the Unionidæ.\* "Animal having the inner branchiæ free from the abdominal sac for from one-half to their entire length; marsupium occupying the whole length of the outer gills only, forming a thick, smooth pad when filled with young; gills united to the mantle behind to their extreme points, or very nearly so; papillæ on branchial and anal openings unbranched; superanal opening always closed below."

## Section LYMNIMUM.

*Lymnium*, Oken, Lehrbuch, 1815, p. 237.

TYPE, *Unio pictorum*, Retzius; Europe.

*Range.* Europe; N. and C. Asia.

Oken's description being totally inadequate, it has been amplified by Simpson as follows:—"Shell generally smooth; beak sculpture broken, often somewhat corrugated or pustulous;

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\* Washington, D.C., Smithsonian Inst. Nat. Mus. Proc. xxii, 1900, p. 680.

pseudocardinals compressed; beak cavities well excavated, not compressed. Animal highly coloured, anal opening crenulate or smooth."

265. *Unio mongolicus*, Middendorff.

*Unio mongolicus*, Middendorff, Sib. Reise, ii, 1851, p. 277, pl. 27, figs. 7, 8; Hessling, Perl. und Ihre Perlen, 1859, p. 203; Schrenck, Reise und Forsch. im Amur-Lande, ii, 1867, p. 699; Westerlund, Kong. Svensk. Vet.-Ak. Handl. xiv, no. 12, 1876, p. 74; Pætel, Conch. Sam. iii, 1890, p. 159; Westerlund, Faun. der Pal. ii, pt. 7, 1890, p. 113.

*Original description*:—Testa transversim oblonga, subreniformi, tumescente, fusca; latere postico anticum quater superante; margine ventrali nonnihil retuso; margine cardinali primo ventrali paralleli et tum, inde a dimidio latitudinis, in rostrum asymmetricum, inferum, descendente; umbonibus prominulis, erosis; dentibus cardinalibus parvis, crassiusculis; dentibus lateralibus evolutis.

Long. 32, lat. 76, diam. 24 mm.

*Hab.* A mountain stream at Gorbitza in Daurien.

There is a single specimen in the National Collection which is indistinguishable from that in the Indian Museum from the Upper Indus.

Genus **NODULARIA**.

*Nodularia*, Conrad, Proc. Acad. Nat. Sci., Philadelphia, vi, 1853, p. 268; Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 806.

TYPE, *Unio douglasice*, Gray; China.

*Range.* China; Japan; Eastern Siberia; Indo-China; India; Borneo; Java; Sumatra; New Guinea; Africa.

Shell nodose; cardinal teeth robust, single in the right valve; in each valve the principal cardinal tooth is parallel with the lateral teeth, or directed towards the posterior extremity of the shell.

Section *NODULARIA* (*sensu stricto*).

See above.

266. *Nodularia* (*Nodularia*) *digitiformis* (Sowerby).

*Nodularia* (*Nodularia*) *digitiformis* (Sowerby); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc., xxii, 1900, p. 809.

*Unio digitiformis*, Sowerby, Conch. Icon. xvi, 1868, pl. 65, fig. 333; Pætel, Conch. Sam. iii, 1890, p. 150

*Original description*:—Shell narrow, elongated, very tumid, very thick, covered with a black, smooth epidermis, white within, anterior teeth large, jagged, posterior teeth laminar, elongated; posterior side oblique, angular, acuminate at the end of the angle, ventral margin slightly swelled posteriorly, then contracted, straight in the middle; anterior side very short, umbones large.

No dimensions are given with the description, but the following are taken from Sowerby's figure.

Long. 35·5, lat. 99 mm.

*Hab.* India.

267. *Nodularia* (*Nodularia*) *cæruleus* (Lea).

*Nodularia* (*Nodularia*) *cæruleus* (Lea); Simpson, Syn. Naiades, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, pp. 811, 812.

*Unio cæruleus*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. iv, p. 95, pl. 13, fig. 25; Obs. on Unionidæ, i, p. 105, pl. 13, fig. 25.

*Margarita* (*Unio*) *cæruleus*, Lea, Syn. 1836, p. 26; 1838, p. 20.

*Margaron* (*Unio*) *cæruleus*, Lea, Syn. 1852, p. 30; 1870, p. 47.

*Unio gerbidoni*, Eydoux, in Guer. Mag. de Zool. 1838, p. 9, pl. 118, figs. 2, 2a, 2b; H. & T., C. I. 1876, p. 6, pl. 12, fig. 2.

*Unio substriatus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, viii, 1856, p. 93; Obs. on Unionidæ, vi, 1857, p. 20, pl. 26, fig. 14.

*Margaron* (*Unio*) *substriatus*, Lea, Syn. 1870, p. 47.

*Unio humilis*, Lea, Proc. Acad. Nat. Sci. Philadelphia, viii, 1856, p. 93; Obs. on Unionidæ, vi, 1857, p. 16, pl. 26, fig. 10.

*Margaron* (*Unio*) *humilis*, Lea, Syn. 1870, p. 32.

*Unio corrianus*, Küster, Conch.-Cab., *Unio*, 1861, p. 229, pl. 67, fig. 5.

*Unio leioma*, Benson, A. M. N. II. 1862, p. 192; H. & T., C. I. 1876, p. 6, pl. 12, fig. 6.

*Unio pilatus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, x, 1866, p. 133; Journ. Acad. Nat. Sci. Philadelphia, vi, 1868, p. 181, pl. 38, fig. 95.

*Margaron* (*Unio*) *pilatus*, Lea, Syn. 1870, p. 47.

*Unio evittatus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, 1868, p. 133; Lea, Journ. Acad. Nat. Sci. Philadelphia, vi, 1868, p. 279, pl. 38, fig. 92.

*Margaron* (*Unio*) *cristatus*, Lea, Syn. 1870, p. 47.

*Unio trirostris*, Sowerby, Conch. Icon. xvi, pl. 65, fig. 331.

*Original description*:—Testa angusto-elliptica, transversa, inæquilateralis, subcylindracea; valvulis tenuibus; natibus prominulis, rotundatis; dentibus cardinalibus lamelliformibus, et in dextra valvula sola duplicibus; lateralibus rectis margarita cæruleo-alba et iridescente.

*Hab.* River Hooghly.

To the above locality may be added the following, from which specimens are represented in the Indian Museum, Calcutta: Rampur; Siliguri; Patna; Jamalpur, Phenchooganj, Central Sylhet; Barrack River, Silchar; Darjiling; Kochk; Rajputana; Manbhoom; Rohri, Sukkur District, Sind; Saharumpur, United Provinces; Lower Nerbudda; Sambalpur, Bengal; Bhagulpur; Rajmahal; Umballa; Poonassa; Burwani; Bagh; Hazrapur.

A very widely spread form, as will be seen from the list of localities quoted above; to a certain degree it varies considerably; always corrugatedly sculptured in the umbonal region, this character may be either restricted to the extreme umbone, or spread over the greater portion of the surface of the shell.

A number of so-called species have been constituted out of its many varietal forms, of which, perhaps, that most often quoted is *U. leioma*, Benson, but on examination of a large series there can be no doubt that these must be relegated to synonymy.

Below are given the measurements of four specimens in the Indian Museum, No. 1 being from Calcutta, No. 2 from Bagh, No. 3 from Umballa, and No. 4 from Poonassa.

	1.	2.	3.	4.
Long. ....	20	17.25	25.25	30 mm.
Lat. .. ....	39.75	30	49.5	56 mm.
Diameter ....	12	11	18.75	21 mm.

**Var. gaudichaudi (Eydoux).**

*Unio gaudichaudi*, Eydoux, Mag. de Zool. 1838, Cl. v, p. 10, pl. 118, fig. 3.

*Margaron (Unio) gaudichaudi*, Lea, Syn. 1850, p. 32; 1870, p. 50.

*Nodularia gaudichaudi*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 812.

Shell oval, transverse, inequilateral; umbones not prominent, slightly roughened, covered with a periostracum; the anterior side is short and rounded; the posterior is broader and obscurely angled; the whole shell slightly swollen; texture of shell thin, finely or irregularly striate and covered with a dirty brown or yellowish periostracum; interior of shell nacreous, of a pinkish violet shade; hinge very narrow and nearly straight, a single, rough and projecting cardinal tooth appearing on the right valve and two oblique and unequal cardinal teeth in the left valve; lateral teeth very thin, smooth, obliquely truncate at the posterior end, the plates of the opposite valve, between which it fits, of nearly equal size.

Long. 22.5, lat. 38.25 mm.

*Hab.* Rivers of Bengal.

**Var. keraudreni (Eydoux).**

*Unio keraudreni*, Eydoux, Mag. de Zool. 1838, Cl. v, p. 8, pl. 118, fig. 1.

*Margaron (Unio) keraudreni*, Lea, Syn. 1852, p. 30; 1870, p. 46.

Shell oblong-ovate, somewhat depressed, very inequilateral, smooth; anterior side obtuse, short; posterior side gently attenuated with blunt extremity; umbones scarcely prominent, much eroded; remainder of outer surface covered with a dark brown periostracum; interior of shell nacreous and tinged with

yellowish white; hinge narrow, rather sinuous in the median part; cardinal tooth lamelliform, carious somewhat oblique fitting into the opposite valve between two small unequal teeth joined at their base and denticulated above; posterior lateral tooth lamelliform, sharp, inserted in the opposite valve between two lamellæ, quite as narrow as that of the left valve; muscular scars sub-circular, the anterior rather deep, the posterior very superficial.

Long. 22·5, lat. 40·5 mm.

*Hab.* Small streams and marshes of Bengal, it is found in great profusion in the neighbourhood of Chandernagor.

## 268. *Nodularia (Nodularia) shurtleffiana (Lea).*

*Nodularia (Nodularia) shurtleffiana* (Lea); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, p. 813.

*Unio shurtleffianus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, viii, 1856, p. 94; Obs. on Genus *Unio*, vi, p. 22, pl. 27, fig. 17; Journ. Acad. Nat. Sci. Philadelphia, iii, p. 302.

*Margaron (Unio) shurtleffianus*, Lea, Syn. 1870, p. 32.

*Original description*:—Testa minute plicata, elliptica, inæquilateralis, subcylindracea, postice obtuse angulata, antice rotundata, ad latus subplanulata; valvulis subcrassis; natibus prominulis, ad apices minute undulatis; epidermide virido-lutea; dentibus cardinalibus sublongis, compressis geminisque; lateralibus longis subrectisque; margarita salmonis colore tineta et viridescente.

*Hab.* Siria River, India (*Major Le Conte*); Ahmednugger (*Shurtleff*).

There are also specimens in the Indian Museum which cannot be separated from this species from Myadong and Shuaygoomyo, Burma. It is of doubtful specific rank, unfortunately very few specimens have been available for examination; probably, could a large series be brought together, it would prove to be but a variety of *N. cœrulea*.

The dimensions of three specimens in the British Museum which agree well with Lea's original figure and description are:—

	1.	2.	3.
Long.....	24	22·5	20 mm.
Lat. ....	44	44	35 mm.
Diam. ....	14·25	15	12·75 mm.

## 269. *Nodularia (Nodularia) occata (Lea).*

*Nodularia (Nodularia) occata* (Lea); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 813.

*Unio occatus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iv, 1860, p. 307; Journ. Acad. Nat. Sci. Philadelphia, vi, 1863, p. 398, pl. 50, fig. 304; Obs. on Genus *Unio*, x, 1863, p. 34, pl. 50, fig. 304.

*Margaron (Unio) occatus*, Lea, Syn. 1870, p. 31.

*Unio macilentus*, Benson, A. M. N. H. x, 1862, p. 187; H. & T., C. I. p. 5, pl. 10, fig. 2, & p. 62, pl. 154, fig. 5.

*Unio rugosus*, H. & T., C. I. p. 62, pl. 154, fig. 3.

*Original description*:—Testa plicata, elliptica, rugoso-occata, compressa, valde inæquilaterali, postice biangulata, antice regulariter rotundata; natibus prominulis, valde compressis, ad apices plicis, pulchris divaricatis; epidermide luteo-oliva et valde rugosa; dentibus cardinalibus parvis, compressis, obliquis; lateralibus sublongis subcurvisque; margarita alba et valde iridescente.

*Hab.* Bengal (*W. A. Haines*).

The dimensions given below are those of a specimen in the British Museum with locality "Bengal," which, although somewhat larger than that figured by Lea, agrees well with his figure and description.

Long. 22, lat. 42, diam. 15.25 mm.

It may here be noted that, upon examination, the specimen now in the British Museum, figured by Hanley in the 'Conchologia Indica', pl. 10, fig. 4, and which was most probably copied by Sowerby in the 'Conchologia Iconica' on pl. 79, fig. 412, proves to be a very immature example of a totally different species.

## 270. *Nodularia (Nodularia) pachysoma* (*Benson*).

*Nodularia (Nodularia) pachysoma* (*Benson*), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 813.

*Unio pachysoma*, Benson, A. M. N. H. x, 1862, p. 186; H. & T., C. I. 1876, p. 6, pl. 12, fig. 1.

*Margaron (Unio) pachysoma*, Lea, Syn. 1870, p. 63.

*Unio pachystoma*, Pætel, Conch. Sam. iii, 1890, p. 162.

*Original description*:—Testa transverse ovato-elongata, inæquilaterali, tenuiuscula, valde tumida, antice brevi rotundata, postice breviter alata, demum modice acuminata, margine ventrali subrecto, postice ascendente; disco læviusculo, polito, transverse striatulo, postice dense striato; epidermide viridi, fasciis nonnullis luteis radiisque obscuris ornata, postice cærulescenti-viridi; umbonibus prominentibus versus apices contiguos minute radiato-costatis, carina umbonali prominente obtusa, linea secunda radiata interjacente; dentibus cardinalibus duplicibus, laminatis, lateralibus modice elongatis, valvæ sinistræ solum duplicibus; margarita pallide purpurea, interdum salmonis colore tincta.

Long. 23, lat. 44, diam. 22 mm.

*Hab.* Brahmapootra River, Assam; also Sawaddy, Burma (Indian Museum Coll.).

The anterior cicatrices are distinct, the posterior confluent, the dorsal ones under the cardinal teeth. The inner lamina of the latter in the left valve is sometimes obsolete.

It differs from *U. cæruleus* in being more inflated and devoid of radiate corrugations on the slopes, the posterior side is excavated

and the colour of the interior of the shell also distinguishes it from that species.

271. *Nodularia (Nodularia) chaudhurii*, Preston.

*Nodularia (Nodularia) chaudhurii*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 290.

*Original description*:—Shell small, rather thin, elongately ovate, pale olive, covered with a finely laminiferous periostracum; both valves concentrically striate, sculptured with irregular, minute, nodulous, radiate ridges which appear posteriorly as regular corrugations; umbones small, somewhat prominent; dorsal margin



Fig. 7.—1 & 2. *Nodularia (N.) chaudhurii*, Preston (type), nat. size.  
3. Hinge and muscular scars of same.

slightly arched; ventral margin straight; anterior side produced, rounded; posterior side bluntly rostrate, abruptly sloping above and below; hinge teeth elongate, anteriorly projecting; anterior scars deep, roundly triangular; posterior scars scarcely impressed; interior of shell iridescent, nacreous, posteriorly corrugate.

Long. 12·75, lat. 23 mm.

*Hab.* Upper Burma.

The type is in the Indian Museum.

272. *Nodularia (Nodularia) bonneaudi* (Eydoux).

*Nodularia (Nodularia) bonneaudi* (Eydoux); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 813.

*Unio bonneaudi*, Eydoux, in Mag. de Zool. 1838, Cl. v, pp. 10–11, pl. 119, figs. 1, 1 a; H. & T., C. I. pl. 10, fig. 6.

*Margaron (Unio) bonneaudi*, Lea, Syn. 1852, p. 32; 1870, p. 50.

Shell oval, transverse, swollen, inequilateral, of thin texture, gently sinuous in the median region; the anterior side obtuse, short; posterior side obscurely angled; umbones scarcely prominent and not eroded; the outer surface irregularly furrowed by multitudinous striæ, covered with a thin yellowish green periostracum; interior of shell nacreous, white; hinge narrow, the anterior margin of the right valve bearing two lamelliform teeth of equal size, the left valve bearing a single rather large crest-like

tooth also on the margin, at the base of which appears a second and much smaller tooth; posterior lateral gently curved, narrow, sharp, falling between two equal sized lamellæ in the left valve; anterior muscular scar moderately to slightly deep, posterior muscular scar superficial.

Long. 27, lat. 47·25 mm.

*Hab.* Rivers of India; Pegu (Ind. Mus. Coll.).

The species seems to vary greatly in shape and colour, some specimens, in the long series of the Indian Museum Collection, being posteriorly much more rostrate than others. while in some the dorsal margin is angled posteriorly and produced anteriorly. In colour the species seems to vary from pale yellowish green to dark blackish brown, and thus two extremes might easily be taken at first sight for different species: there does not seem, however, to be any clear line of demarcation between the many varieties, all of which merge into one another when a sufficiently large series is examined.

### 273. *Nodularia* (*Nodularia*) *pugio* (*Benson*).

*Nodularia* (*Nodularia*) *pugio* (Benson); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 814.

*Unio pugio*, Benson, A. M. N. H. x, 1862, p. 193; Sowerby, Conch. Icon. pl. 45, fig. 516; H. & T., C. I. 1876, p. 5, pl. 10, fig. 7.

*Original description*:—Testa transverse elongato-triangulari, linguæformi, valde inæquilaterali, compressiuscula, crassa, antice brevissima, subito descendente rotundata, postice sensim angustiore, cuneiformi, demum acuminata, margine dorsali recta, ventrali convexiusculo, postice ascendente; umbonibus late planatis, lævibus, prominentibus, carina umbonali subito obtuse angulata, area interjacentem versus cardinem descendente; disco subplanulato, læviusculo, substriato; dente cardinali (valvæ dextræ) brevi, crassa prominente, radiato-sulcata, laterali elongata, subduplicata, intus crenulata: margarita albida, iridescente.

Long. 21, lat. 42, diam. 16 mm.

*Hab.* Neighbourhood of Ava, Pegu (Indian Mus. Coll.); also recorded from the Barrack River, Silchar.

A curious species whose smooth surface and anteriorly swollen and posteriorly cuneiform shape easily distinguish it from any other Indian members of the family.

### 274. *Nodularia* (*Nodularia*) *gratiosa* (*Philippi*).

*Nodularia* (*Nodularia*) *gratiosa* (Philippi); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 815.

*Unio gratiosus*, Philippi, Conch. i, 1845, p. 20, pl. 1, fig. 5; Catlow & Reeve, Conch. Nom. 1845, p. 59, ? Kuster, Conch. Cab., *Unio*, 1861, p. 239, pl. 80, fig. 3.

*Margaron* (*Unio*) *gratiosus*, Lea, Syn. 1870, p. 32.



*Original description*:—Testa minuta, transversim oblonga, antice rotundata, postice latiore subrostrata, rugio radiantibus, confertissimis sculpta, sordida lutescente et virescente; dente cardinali, valvæ dextræ compresso triangulari; valvæ sinistræ humili, sub vertice appendiculato; dentibus lateralibus valvæ sinistræ geminis; margarita ex luteo rubente.

Height 156.5, length 273.5, diam. 91 mm.

The species would seem to be very doubtfully Indian.

## 275. *Nodularia (Nodularia) crispata (Gould)*.

*Nodularia (Nodularia) crispata* (Gould); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 815.

*Unio crispata*, Gould, Proc. Boston Soc. Nat. Hist. i, 1843, p. 141; Otia Conch. 1862, p. 191.

*Unio crispatus*, Catlow & Reeve, Conch. Nom. 1845, p. 58; H. & T., C. I. 1876, p. 21, pl. 45, fig. 1.

*Margaron (Unio) crispatus*, Lea, Syn. 1870, p. 32.

*Unio scobinatus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, viii, 1856, p. 93; Obs. on Genus *Unio*, 1857, p. 19, pl. 26, fig. 13.

*Margaron (Unio) scobinatus*, Lea, Syn. 1870, p. 32.

*Unio mandarinus*, Morelet, J. Conchyliol., Paris, xii, 1863, p. 159.

*Unio pellis-lacerti*, Morelet, J. Conchyliol., Paris, xiii, 1865, p. 22; Sowerby, Conch. Icon. xvi, 1868, pl. 86, fig. 457.

*Unio venustus*, Morelet, J. Conchyliol., Paris, xiv, 1866, p. 63.

*Unio oblatas*, Lea, Syn. 1870, p. 64.

*Original description*:—Testa ovali-elongata, inæquilaterali, antice rotundata, postice subrostrata, costaque umbonali; umbonibus parvis; colore virescente, fusco variegata; rugis angulatis radiantibus undique crispata: intus livida; dentibus parvis obtusis.

Long. 23, lat. 43, diam. 13 mm.

*Hab.* Tavoy; also Siam and Battambang, Cambodia (Indian Museum Coll.).

A very beautiful species easily recognizable by its curious sculpture, consisting of dark green, nodulous, waved ridges running anteriorly in a horizontal, and posteriorly in a longitudinal direction upon a ground of bright brownish-yellow.

## 276. *Nodularia (Nodularia) scobina (Hanley)*.

*Nodularia (Nodularia) scobina* (Hanley); Simpson, Washington D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 816.

*Unio scobina*, Hanley, Rec. Biv. Shells p. 382, pl. 23, fig. 40; Hanley & Theobald, Cat. L. & F. W. Shells Brit. Ind. p. 49; H. & T. C. I. pl. 46, fig. 2.

*Original description*:—[Shell] oblong, inequilateral, moderately thick, rather compressed, with a dark green ray on the anterior slope, densely covered with raised corrugations, which, upon the simple umbonal slope are disposed in somewhat transverse divergent curved narrow folds, are angularly met beyond it by similar raised wrinkles, are arranged upon the hinder extremity in

short subtransverse angularly flexuous lines, and elsewhere are broken into short zigzags, or angular dots (like a worn out rasp); dorsal and ventral edges subparallel, the latter straightish, a little refuse; anterior side bluntly biangulated; umbones eroded, not prominent; nacre bluish, iridescent in front; anterior lateral tooth elongated, posterior lateral tooth very short, much elevated . . . . The primary tooth, in the only valve known to me, is a mere callus.

Long. 18, lat. 32 mm.

*Hab.* Assam; Seebaugor (Indian Mus. Coll.).

The dimensions of two specimens in the Indian Museum are:—

	1.	2.
Long. . . . .	13	12.5 mm.
Lat. . . . .	23	22 mm.
Diam. . . . .	6.75	7 mm.

## 277. *Nodularia (Nodularia) andersoniana* (Nevill).

*Unio andersonianus*, Nevill, J. A. S. B. xlv, 1877, p. 40; Yunnan Exp. pl. 80, fig. 9.

*Original description*:—Shell allied to *U. pachysoma*, Bens., and to some of the varieties of *U. cœruleus*, Lea. It is easily distinguished from *U. bonneaudi* by its more irregular shape, thinner texture, by the acute angulation, greater production posteriorly, and by the more developed sculpture; a constant character also is the pink colour of the nacre, which in *U. bonneaudi* is bluish white, this is equally distinct and characteristic in young as in old specimens.

Long. 15.5, lat. 32, diam. 11.75 mm.

*Hab.* Myadong, Burma.

## 278. *Nodularia (Nodularia) theobaldi*, Preston.

*Nodularia (Nodularia) theobaldi*, Preston, Rec. Ind. Mus. Calcutta, vii, 1912, p. 292.

*Original description*:—Shell ovately rectangular, very slightly curved, gaping anteriorly, moderately solid, concentrically striate, covered with a dark olivaceous periostracum; umbones small, not prominent; dorsal margin somewhat arched, ventral margin slightly excavated in the median region, otherwise straight; anterior side slightly produced and somewhat sharply rounded; posterior side very obtusely rostrate, steeply sloping above, then sharply rounded and again sloping inwards below; cardinal teeth in right valve roughly triangular, jagged, somewhat inwardly projecting, fitting between two teeth in the left valve, which are roughened and of which the anterior is rather broad and massive; lateral teeth in both valves elongate and nearly straight; anterior

scars somewhat deeply excavated, especially above; posterior scars ovate, lightly impressed; interior of shell nacreous shading from

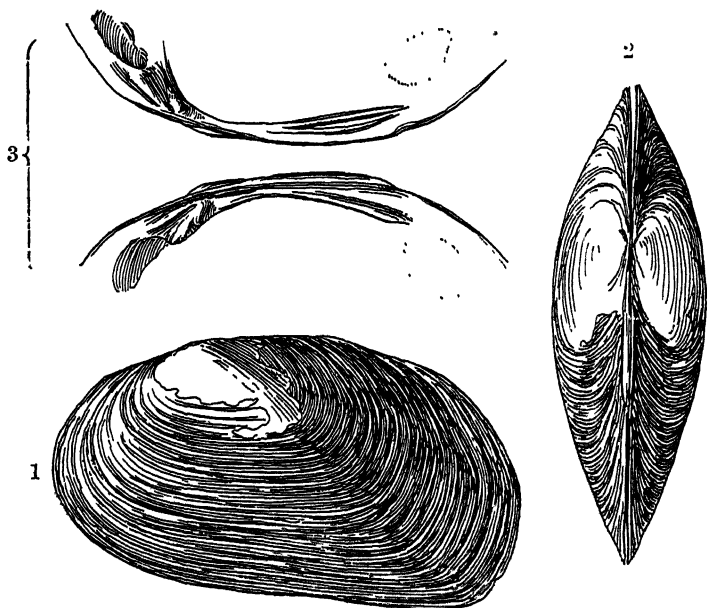


Fig. 8 —1 & 2. *Nodularia (N.) theobaldi*, Preston (type), nat. size.  
3. Hinge and muscular scars of same.

pale flesh-colour to bluish iridescent, especially towards the posterior margins.

Long. 34, lat. 60, diam. 19 mm.

*Hab.* Manipur.

The type is in the Indian Museum.

## 279. *Nodularia (Nodularia) olivaria* (Lea).

*Nodularia (Nodularia) olivaria* (Lea) Simpson, Washington, D.C.,  
Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 817.

*Unio olivarius*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. iv,  
(n. s.) p. 108, pl. 16, fig. 38; Obs. Genus *Unio*, i, p. 118, pl. 16,  
fig. 33; H. & T., C. I. p. 5, pl. 10, fig. 1.

*Margarita (Unio) olivarius*, Lea, Syn. 1836, p. 26; 1838, p. 20;  
1852, p. 30; 1870, p. 47.

*Unio pumilio*, Küster, Conch. Cab., *Unio*, 1862, p. 268, pl. 90,  
fig. 7.

*Original description*:—Testa ovata, transversa, inflata, pellucida;  
valvulis pertenuibus; natibus prominulis; epidermide pertenui,  
læve et olivæ colorem habente; dentibus cardinalibus magnis

laminatis erectisque, lateralibus laminatis brevibusque; margarita pertenui albaque.

Long. 20, lat. 38, diam. 18 mm.

*Hab.* Burrill River (*Dr. Burrough*); specimens in British Museum from Moradabad, Agra, and Rohilkund Streams (the last figured in *Conch. Icon.* pl. x, fig. 1); in Indian Museum from Assam and Saharanpur.

The above description is amplified by the following note:—

“Shell ovate, transverse, inequilateral, inflated, pellucid: substance of the shell very thin; beaks slightly elevated, rounded and devoid of undulations: ligament very small: epidermis olive, very thin and smooth: rays obscure: cardinal teeth large, erect, and lamelliform; lateral teeth short and lamelliform: anterior cicatrices slightly confluent: posterior cicatrices confluent: dorsal cicatrices not perceptible: cavity of the beaks wide: nacre very thin and bluish white.

“*Remarks.*—..... It is a perfectly distinct species, and may easily be recognised by its form, its pellucidity and its smooth olive-coloured epidermis. It somewhat resembles a young *Anodonta* on the exterior, but the elevated lamelliform teeth easily distinguish it from that genus. Its resemblance to a Spanish olive is very striking.”

## 280. *Nodularia* (*Nodularia*) *nuttalliana* (*Lea*).

*Nodularia* (*Nodularia*) *nuttalliana* (*Lea*); Simpson, Washington, D.C., *Smiths. Inst., Nat. Mus. Proc.* xxii, 1900, p. 817.

*Unio nuttallianus*, *Lea*, *Proc. Ac. Nat. Sci. Philadelphia*, viii, 1856, p. 103; *Obs. Genus Unio*, vi, 1857, p. 30, pl. 30, fig. 25; *Journ. Acad. Nat. Sci. Philadelphia*, iii, 1858, p. 310, pl. 30, fig. 25; *H. & T., C. I.* p. 19, pl. 41, figs. 5, 6.

*Margaron (Unio) nuttallianus*, *Lea*, *Syn.* 1870, p. 74.

*Original description*:—Testa lævi, elliptica, subinflata, inæquilaterali; valvulis tenuibus; natibus prominulis; epidermide olivacea, eradiata, valde polita; dentibus cardinalibus parvis, rectis, compressis crenulatisque; lateralibus subcurtis, subrectis lamellatisque; margarita salmonis colore tincto et iridescente.

*Hab.* India (*Prof. Thomas Nuttall*).

No dimensions are given with the above description; there are, however, several specimens of the species in the British and Indian Museum Collections, of which the measurements of three are as follows; No. 1 being in the British and Nos. 2 and 3 in the Indian Museum.

	1.	2.	3.
Long. . . . .	23·25	19	17·75 mm.
Lat. . . . .	38	31·25	28·5 mm.
Diam. . . . .	15	11·5	10·5 mm.

Allied to *N. olivaria*, but of a darker colour and more convex, with more rounded ventral margin and generally ovate form.

281. *Nodularia (Nodularia) involuta* (Benson).

*Nodularia (Nodularia) involuta* (Benson); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 817.

*Unio involutus* (Benson), in Hanley, Rec. Biv. Shells, 1856, p. 385, pl. 23, fig. 19; H. & T., C. I. p. 19, pl. 41, fig. 2.

*Original description*:—Peaked ovate, not so very inequilateral, compressed in front, swollen in the umbonal region, thin, polished, rather pale green, very obscurely subradiated ventrally with ochre-yellow, rather tinged with blue dorsally, marked with 2 or 3 dark green lines on the anterior slope, partially marked with some close and regular shallow groove-like posterior wrinkles, elsewhere smooth; ventral edge strongly arcuated and much rising behind, less curved yet almost equally rising in front; anterior side tapering to a blunt subcentral peak, no umbonal ridge; hinder dorsal edge nearly straight, scarcely sloping; umbones swollen, prominent, with a few longitudinal corrugations; beaks incurved; nacre silvery; umbonal cavity ample; lateral teeth large, laminar, raised, the shorter one very elevated at its extremity.

"In the single specimen described from, there is no cardinal tooth, but the hinge-plate is elevated beneath the umbones."

Long. 34, lat. 48 mm.

*Hab.* Assam.

A curiously thin, smooth, boat-shaped form which is considerably inflated, the diameter respectively of a right and left valve in the British Museum Collection being 10·75 and 9·5 mm.

Section *RADIATULA*.

*Radiatula*, Simpson, Washington D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 820.

TYPE, *Unio crispisulcatus*, Benson; Burma.

*Range.* Burma; Assam; Cambodia.

*Original description*:—Shell rather solid, triangular oval, with high beaks which are but little inflated, not very full at post base, bluntly pointed behind, the beaks and entire surface covered with radiating, occasionally slightly zigzag or divaricate ridges, which are cut more or less into nodules or cancellations by concentric sulcations; the sculpture of the posterior slope stronger, and curving upward; pseudocardinals of the left valve 2 to 3, ragged, the anterior larger, two in the right valve, with a parallel-sided socket, the larger teeth compressed but rather solid.

282. *Nodularia (Radiatula) crispisulcata* (Benson).

*Nodularia (Radiatula) crispisulcata* (Benson); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 820.

*Unio crispisulcatus*, Lea, A. M. N. H. x, 1862, p. 193; Sowerby, Conch. Icon. xvi, 1866, pl. 49, fig. 262.

*Margaron (Unio) crispisulcatus*, Lea, Syn. 1870, p. 149.

*Original description*:—Testa transverse subovata, subinæquilateralis; antice rotundata, postice superne descendente, leviter angulata, demum obtuse angulata, crassiuscula, compressiuscula; disco convexiusculo minutissime radiatim rugoso-costulato, costulis nonnullis acute divaricatis, posterioribus latioribus; umbonibus prominentibus, contiguïs, apicibus acutiusculis; epidermide luteo-olivacea, postice fuscata, hic illic nonnunquam viridiscente; dentibus cardinalibus utriusque valvæ duplicibus, lamellatis, lateraliibus obliquis, modice elongatis, valvæ sinistræ duplicibus: margarita cæruleo-albida iridescente.

Long. 28, lat. 45, diam. 16 mm.

*Hab.* Bangong River near Thyet-Myo, Burma (*W. Theobald*); Pegu (Indian Mus. Coll.).

To the above description is appended the following note:—

"The anterior cicatrices are distinct, the posterior confluent, the apical ones above the moderate angular cavity, and running under the cardinal tooth.

"The delicate sculpture over the whole disk of this shell is peculiar. In form it does not approach any Gangetic type."

A well-marked and apparently very constant form, the large series of about twenty-three specimens in the Indian Museum Collection, from the Irrawaddy near Thyetmio and Pegu, practically showing no variation whatever.

### 283. *Nodularia (Radiatula) lima*, Simpson.

*Nodularia (Radiatula) lima*, Simpson, Washington, D.C., Smiths. Inst., Nat Mus. Proc. xxii, 1900, p. 820.

*Unio radula* (Benson), Hanley, Rec. Biv. Shells, Supp. 1856, p. 382, pl. 23, fig. 41; H. & T., C. I. p. 5, pl. 10, fig. 3.

*Dysonomia radula*, Rochebrune, Bull. Soc. Philom. Paris vi, 1882, p. 42.

*Original description*:—Transversely oboval, inequilateral, not very thick, rather compressed, olivaceous, sculptured as in *U. scobina*, but rather more linearly and transversely; ventral and front dorsal edges convex and subparallel; hinder extremity rounded, narrower: umbonal ridge inconspicuous, umbonal slope simple; neither the eroded umbones nor the ligament prominent; nacre bluish; umbonal cavity shallow; hinder tooth strong, complicated; front lateral tooth elongated, a little curved.

Long. 19, lat. 32 mm.

*Hab.* Assam; Siliguri and Sikkim (Indian Mus. Coll.).

Extremely variable in sculpture and form; in some specimens the corrugations extend over the whole surface of the shell, while in others they are confined merely to the umbonal region; in general outline it varies from ovate to trapezoidal as the

following measurements of four specimens in the Indian Museum show:—

	1.	2.	3.	4.
Long. ....	19	19	14	16.25 mm.
Lat. ....	33.5	31.25	22.5	23 mm.
Diam. ....	12	11.25	8.75	9.25 mm.

Var. *siliguriensis*, *Preston*.

*Unio siliguriensis*, *Preston*, *Rec. Ind. Mus.*, Calcutta, ii, p. 47 (fig. in text); *op. cit.* vii, p. 293, as *N. (R) lima*, var. *siliguriensis*.

*Original description*:—Shell inequilateral, ovate oblong, reddish brown, sculptured with concentric lines of growth and oblique transverse wrinkles, these latter being especially marked posteriorly; anterior side rounded; posterior side acuminate rounded; dorsal margin arched; ventral margin very slightly contracted in the middle; umbones much eroded; interior of shell iridescent, pale bluish white.

Long. 21, lat. 37.75 mm.

*Hab.* Siliguri, N. Bengal.

Type in Indian Museum, Calcutta.

Genus **PHYSUNIO**.

*Physunio*, *Simpson*, Washington, D.C., *Smiths. Inst., Nat. Mus. Proc.* xxii, 1900, p. 830.

TYPE, *Unio gravidus*, *Lea*, from Siam, Cambodia, and Cochin China.

*Range.* Siam; Cochin China; Cambodia; Sumatra; Assam.

*Original description*:—Shell thin, irregularly obovate, narrowed in front, decidedly produced at post base, pointed behind, and posteriorly winged, with a moderate posterior ridge and often a second or third faint ridge above it; beak sculpture zigzag radial, somewhat disposed in two sets, the one down the posterior ridge slightly nodulous; posterior slope having irregular radial corrugations, the rest of the shell smooth; epidermis often cloth-like, with one or more green rays on the posterior slope; hinge-line curved; a single obliquely granularly striate pseudocardinal and generally three laterals in the left valve, and two pseudocardinals and two laterals in the right, all greatly compressed; beak cavities deep; muscle scars irregular; nacre bright, bluish, and iridescent. Animal unknown.

Section *LENS*.

*Lens*, *Simpson*, Washington, D.C., *Smiths. Inst., Nat. Mus. Proc.* xxii, 1900, p. 831.

TYPE, *Unio eximus*, *Lea*, from Siam and Cambodia.

*Range.* Siam; Cambodia; Assam.

Shell sublenticular; three laterals of left valve distinct; cavity of the beaks compressed.

#### 284. *Physunio (Lens) velaris* (Sowerby).

*Physunio (Lens) velaris* (Sowerby); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 881.

*Unio velaris*, Sowerby, Conch. Icon. xvi, 1868, pl. 72, fig. 368; Pæstel, Conch. Sam. iii, 1890, p. 171; Benson in Hanley, Rec. Biv. Shells, p. 385, pl. 23, fig. 42.

*Original description*:—Shell small, thin, rather compressed, pale green, neither radiated nor sculptured; anterior extremity very narrow; posterior side winged, ventral margin arcuated, rising abruptly anteriorwards, beaks very acute, prominent, lunule excavated; nacre white; cardinal teeth large, lamellar, approximate.

The following note is appended to Sowerby's description:—

"The abrupt fall of the front dorsal margin in this symphonote species give a seeming projection to the beaks. Both dorsal edges are angulated above, and rounded off below; the hinder dorsal edge is much elevated. The compression of the valves is especially conspicuous on the anterior portion of the shell."

As the author gives no dimensions the following are taken from the figure in the 'Conch. Icon.'

Long. 55, lat. 59.5 mm.

*Hab.* Assam.

#### Genus **PSEUDODON.**

*Pseudodon*, Gould, Proc. Boston Soc. Nat. Hist. i, 1844, p. 161.

*TYPE*, *Anodonta inoscularis*, Gould, from the Salwen River, Burma.

*Range.* Siam and Indo-China; Burma; China; Java; Sumatra; Borneo; Malacca; Nicobars; Japan.

Hinge margin with a tooth-like apophysis on each valve, the surface of which is not fractured, but smoothly covered with enamel, fitting into corresponding undulations in the opposite valve, that on the right valve closing in front of that on the left.

#### Section *TRIGONODON.*

*Trigonodon*, Conrad, Proc. Boston Soc. Nat. Hist. i, 1865, p. 233.

*TYPE*, *Monocondylaea peyuensis*, Anthony, var. *crebristriata*, Anthony; Pegu.

*Range.* Burma; Cambodia.

Oval, somewhat compressed, with a prominent triangular cardinal tooth in each valve, with a deep pit behind it for the reception of the tooth of the opposite valve.



285. *Pseudodon* (*Trigonodon*) *peguensis* (*Anthony*).

*Monocondylæa peguensis*, Anthony, Am. Journ. Conch. i, 1865, p. 205, pl. 17, fig. 2.

*Margaron* (*Monocondylæa*) *peguensis*, Lea, Syn. 1870, p. 73.

*Pseudodon crebristriatus* var. *peguensis*, H. & T., C. I. 1876, p. 5, pl. 9, fig. 5.

*Pseudodon* (*Trigonodon*) *crebristriatus* var. *peguensis*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 835.

*Original description*.—Shell smooth, rhombic-ovate, inequilateral, somewhat inflated, sub-biangular behind; substance of the shell thick; beaks rather prominent, eroded, but apparently not undulated; ligament short, thin; epidermis dark brown or nearly black, smooth over the umbones and on the anterior portion of the shell, but having the sub-truncate posterior portion nearly covered with distinct corrugated folds, more prominent near the hinge margin; cardinal teeth prominent, curved and slightly bilobed, particularly in the right valve; anterior cicatrices confluent; dorsal cicatrices deeply impressed, placed in a curved line under the beaks; nacre light salmon-colour and very iridescent.

Long. 57, lat. 81, diam. 33 mm.

*Hab.* Pegu.

Var. *crebristriatus* (*Anthony*).

*Monocondylæa crebristriata*, Anthony, Am. Journ. Conch. i, 1865, p. 205, pl. 18, fig. 1.

*Trigonodon crebristriata*, Conrad, Am. Journ. Conch. i, 1865, p. 233.

*Unio crebristriatus*, Sowerby, Conch. Icon. xvi, 1868, pl. 95, fig. 517.

*Margaron* (*Monocondylæa*) *crebristriata*, Lea, Syn. 1870, p. 72.

*Pseudodon crebristriatus*, H. & T., C. I. p. 5, pl. 9, fig. 3.

*Unio vondembuschi*, Sowerby, Conch. Icon. xvi, pl. 95, fig. 518.

*Pseudodon* (*Trigonodon*) *crebristriatus*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 835.

*Original description*.—Shell rhombic, strongly striate, very inequilateral, depressed, bi-angular behind; substance of the shell rather thick; beaks not prominent, eroded, having no indication of any undulations at the tip; epidermis light brown, with occasionally broad green rays on the posterior slope; the umbones and, indeed, the surface is covered with crowded, fine, crenulose striæ, which, on the posterior slope, are crossed at right angles with prominent, regular folds; cardinal teeth prominent, erect, bilobed in the left valve; anterior cicatrices deeply impressed, distinct; posterior cicatrices confluent and indistinct; dorsal cicatrices small, but distinct, and placed at the base of the prominent tooth in the left valve, while in the right valve they are

less distinct and placed a little more posteriorly; nacre light salmon, iridescent.

Long. 32, lat. 53, diam. 13 mm.

*Hab.* Pegu.

Comparing the present variety with what must be considered the typical form of *P. peguensis*, the author makes the following observations:—" . . . uniformly more depressed, lighter coloured; more regularly rhombic in form, and of less size; but the most

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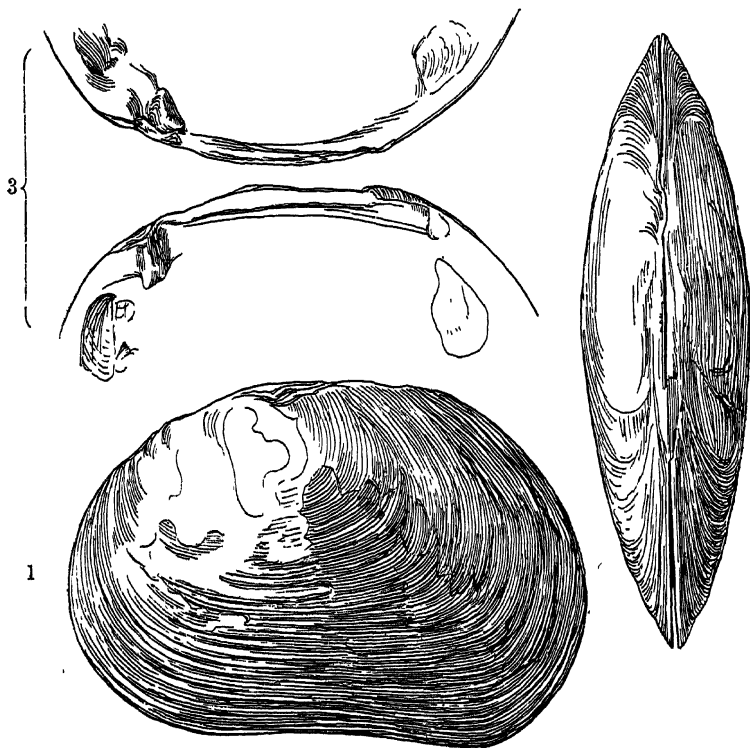


Fig. 9.—1 & 2. *Pseudodon* (*T.*) *peguensis* (*Ant.*) var. *curvata*, Preston.  
(Type) Nat. size.

3. Hinge and muscular scars of same.

prominent difference consists in the beautiful crenulose striæ of the present species, which are densely crowded over the whole surface of the shell, while *M. [P.] peguensis* is remarkably smooth over all except the posterior slope, and there the rugose folds are broader and less numerous than in *M. [P.] crebristriata*; the lines of growth are also more numerous in *M. [P.] peguensis*, generally about 8, while *crebristriata* has rarely more than 3.

Var. *curvata*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 295.

Shell having the ventral margin more curved, and generally less ovate in shape than in the typical form.

*Hab.* Pegu.

Type in the Indian Museum.

#### Section *PSEUDODON*.

*Pseudodon*, Gould, 1884.

For characters and type see description of genus above.

*Range.* Siam and Indo-China; Burma; China; Java; Sumatra; Borneo; Malacca; Nicobar Islands.

#### 286. *Pseudodon* (*Pseudodon*) *inoscularis* (Gould).

*Pseudodon* (*Pseudodon*) *inoscularis* (Gould); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 847.

*Anodon inoscularis*, Gould, Proc. Boston Soc. Nat. Hist. i, 1844, p. 160; H. & T., C. I. p. 5, pl. 9, fig. 2.

*Margaron (Monocondylæa) inoscularis*, Lea, Syn. 1870, p. 73.

*Margaritana inoscularis*, Pætel, Conch. Sam. iii, 1890, p. 173.

*Original description*.—Testa transverse oblonga, sub-ovata, solida, subventricosa, picea: umbonibus parum elevatis; margine supra brevi, recto, ad angulum posticum rotundato, postice subtruncato; infra arcuata; utraque valva processu cardinali crassa, dentiformi, instructa, uno ante altero aptante; margarita albida; impressione musculari antico profundo.

Long. 44, lat. 76, diam. 28 mm.

*Hab.* Salwen River, Burma; Tenasserim (Indian Mus. Coll.).

#### 287. *Pseudodon* (*Pseudodon*) *salwenianus* (Gould).

*Pseudodon* (*Pseudodon*) *salwenianus* (Gould); Conrad, Am. Journ. Conch. i, 1865, p. 233.

*Anodon salwenianus*, Gould, Proc. Boston Soc. Nat. Hist. i, 1844, p. 160.

*Anodonta salweniana*, Gould, Otia Conch. 1862, p. 193.

*Unio salwenianus*, Sowerby, Conch. Icon. xvi, 1868, pl. 94, fig. 513.

*Margaron (Monocondylæa) salweniana*, Lea, Syn. 1870, p. 72.

*Pseudodon salwenianum*, H. & T., C. I. p. 5, pl. 9, fig. 4.

*Monocondylæa salweniana*, Pætel, Conch. Sam. iii, 1890, p. 174.

*Original description*.—Testa trapezoidea, compressa, subtenui, retro dilatata, postice truncata, colore picea; supra costam umbonalem radiatim plicata: umbonibus parum elevatis; margine superiori recta, compressa, ligamentum occultante, ante umbonibus excavata; utraque valva processu dentiformi cardinali, uno ante altero aptante, instructa; cavitate minime profunda; impressionibus muscularibus minime impressis; margarita sub-livida.

Long. 59, lat. 140, diam. 32 mm.

*Hab.* Salwen River, Burma; Tenasserim River (*Ind. Mus. Coll.*).

288. *Pseudodon (Pseudodon) nicobaricus* (Mörch).

*Pseudodon (Pseudodon) nicobaricus* (Mörch); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 838.

*Alasmodonta* (subg. ?) *nicobarica*, O. Fabricius; Mörch, J. Conchyliol., Paris, xx, 1872, p. 327.

*Original description*:—Testa irregulariter ovalis, convexiuscula; striæ incrementi irregulares; dimidium testæ marginem versus olivaceum, fasciis obscurioribus, radiis numerosioribus, obsoletis, obscure viridibus. Intus argentea, postice iridescens. Umbones plani, erosi, antice siti; margo dorsalis parum arcuatus, (margo) anticus rotundatus, angustior, (margo) ventralis antice et postice sat arcuatus, medio leviter inflexus, (margo) post. angustus leviter reflexus. Dentes cardinis fere omnino evanescentes, dens lat. post. linearis obsoletissimus.

*Anodonta zollingeri*, Mousson (Java, p. 96, t. 18, fig. 1), affinis, sed species Fabricii differt: margine ventrali arcuato, postice subito ascendente, nec non margine dorsalis declivi, haud arcuato.

*Hab.* Nicobar Islands (*O. Fabricius*).

The species was described from a single specimen without figure or dimensions being given, it does not seem to have come to light again at any time.

Section *BINEURUS*.

*Bineurus*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 839.

*TYPE*, *Monocondylæa mouhoti*, Lea, from Cambodia and Siam.

*Range*. Cambodia; Siam; Perak; Burma.

*Original description*:—Shell elongate rhomboid, thin, rounded in front, widely and feebly biangulate behind, having two or more raised radiating lines on the posterior slope, which is somewhat obliquely wrinkled; beaks low; surface finely, irregularly, concentrically grooved; epidermis olive; teeth smooth, compressed; nacre bluish.

Animal unknown.

289. *Pseudodon (Bineurus) ava* (Theobald).

*Pseudodon (Bineurus) ava* (Theobald); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 839.

*Monocondylæa ava*, Theobald, J. A. S. B. xlii, 1873, pt. 2, p. 209, pl. 17, fig. 15.

*Original description*:—Testa oblonga, solidiuscula, antice rotundata, postice curvatim truncata. Margine ventrali recto; ligamentali convexo. Umbonibus decorticatis. Epidermide picea in junioribus luteo-flavescente lineis tenuibus obscure radiatim

notata. Testa incrementi lineis concentrice rugata, postice plicis paucis raro notata et valde evanescentibus. Dentibus minimis ut in *M. salweniana*. Nacreæ cærulescente, umbones versus flavescente.

Long. 52, lat. 96, diam. 28 mm.

*Hab.* Near Mandalay.

Allied to *P. salwenianus*, but differing from that species in its more elongate form and smoother surface; young specimens occasionally show traces of sculpture on the posterior slope, but this character disappears when adult.

### Genus **PARREYSIA**.

*Parreysia*, Conrad, Proc. Acad. Nat. Sci. Philadelphia, vi, 1853, p. 267; Simpson, Proc. Acad. Nat. Sci. Philadelphia, xxii, 1900, p. 840.

**TYPE**, *Unio multidentatus*, Philippi. Said to come from Australia but probably an Indian shell.

*Range*. India; Burma; Indo-China; China.

Shell solid, inflated, oval to subrhomboid, with full, high, zigzag, radially sculptured beaks, the sculpture often extending over the disk; epidermis smooth and bright, sometimes a little rayed, with two irregular pseudocardinals in the left valve which are more or less broken into ragged denticles or are strongly, vertically striate, and two laterals, the lower the larger; right valve with one, sometimes two pseudocardinals, the upper small, compressed, and a few tubercles behind them, with two laterals, the upper the larger; cavity of the beaks rather deep, not compressed; dorsal scars under the hinge, not visible; the two upper anterior muscle scars very deep, confluent, the lower linear; nacre white to salmon, iridescent behind.

Animal unknown.

Conrad's name appears to be a *nomen nudum* and Simpson's description is therefore that given above.

### Subgenus **PARREYSIA** (*sensu stricto*).

*Parreysia*, Conrad, 1853.

For type, range and characters see description of genus above.

### 290. *Parreysia* (*Parreysia*) *corrugata* (Müller).

*Parreysia* (*Parreysia*) *corrugata* (Müller); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 841.

*Mya corrugata*, Müller, Verm. Terr. et Fluv. 1774, pt. 2, p. 214; Besch. Ges. Berl. iv, 1779, p. 56, pl. 3 b, figs. 7, 8; Gmelin, Syst. Nat. 13th ed. 1788, p. 3221; Schröter, Flussconch. 1779, p. 181, pl. 9, fig. 3; Wood, Gen. Conch. i, 1815, p. 108, pl. 24, figs. 1-3; Dillwyn, Cat. i, 1817, p. 52; Mawe, Linn. Conch. 1823, pl. 4, fig. 3; Wood, Ind. Test. 1825, p. 12, pl. 2, fig. 31 a; 1856, rev. ed. p. 16, pl. 2, fig. 31.

- Unio corrugata*, Lamarck, An. sans Vert. vi, 1819, p. 78; Deshayes, Enc. Méth. ii, 1827, p. 584, pl. 248, fig. 8.
- Unio (Potamida) corrugata*, Swainson, Tr. on Mal. 1840, p. 268, fig. 51; p. 281, fig. 57.
- Unio corrugata*, Retzius, Diss. Hist. Nat. 1778, p. 18; Spengler, Skriv. Selsk. Nat. iii, 1793, p. 68; Hanley, Test. Moll. 1842, p. 197; Biv. Shells, 1843, p. 197; Catlow & Reeve, Conch. Nom. 1845, p. 57; H. & A. Adams, Gen. Rec. Moll. ii, 1857, pp. 493, 497; Kuster, Conch. Cab., *Unio*, 1862, p. 289, pl. 97, figs. 3, 4; Blanford, J. A. S. B. xxxv, 1867, p. 136; Sowerby, Conch. Icon. xvi, 1868, pl. 71, fig. 360; H. & T., C. I. 1876, p. 21, pl. 45, figs. 2-5; Pætel, Conch. Sam. iii, 1890, p. 149.
- Margarita (Unio) corrugatus*, Lea, Syn. 1836, p. 29; 1838, p. 21.
- Margaron (Unio) corrugatus*, Lea, Syn. 1852, p. 20; 1870, p. 30.
- Mya spuria*, Gmelin, Syst. Nat. 13th ed. 1788, p. 3222; Wood, Gen. Conch. i, 1815, p. 110; Lamarck, An. sans Vert. vi, 1819, p. 80.
- Mya gaditana*, Schreiber's Versuch. 1793.
- Unio multidentatus*, Philippi, Conch. iii, 1847, p. 46, pl. 3, fig. 4; Kuster, Conch. Cab., *Unio*, 1856, p. 136, pl. 36, fig. 5; Pætel, Conch. Sam. iii, 1890, p. 160.
- Margaron (Unio) multidentatus*, Lea, Syn. 1870, p. 50.
- Unio fulmineus*, Philippi, Conch. iii, 1847, p. 46, pl. 3, figs. 5, 6; Kuster, Conch. Cab., *Unio*, 1862, p. 286, pl. 96, figs. 2, 3; Pætel, Conch. Sam. iii, 1890, p. 153.
- Unio lutens*, Lea, Proc. Acad. Nat. Sci. Philadelphia, viii, 1856, p. 93; Journ. Acad. Nat. Sci. Philadelphia, iii, 1857, p. 291, pl. 24, fig. 4; Obs. Genus *Unio*, vi, 1857, p. 11, pl. 24, fig. 4.
- Margaron (Unio) lutens*, Lea, Syn. 1870, p. 46.
- ? *Unio semirugatus*, Chenu, Conch. iii, 1858, pl. 12, figs. 2, 2 a.
- Unio merodabensis*, Kuster, Conch. Cab., *Unio*, 1861, p. 233, pl. 78, fig. 4; Blanford, J. A. S. B. xxxv, 1866, p. 142; Pætel, Conch. Sam. iii, 1890, p. 159.
- Unio wynegungaensis*, H. & T., C. I. 1876, p. 21, pl. 45, fig. 6.
- Unio tenenti*, H. & T., C. I. 1876, p. 22, pl. 45, figs. 7 & 9; Pætel, Conch. Sam. iii, 1890, p. 169.
- Unio phayresi*, Theobald MSS.

*Original description*.—Testa viridescens, tenera, pellucida, ab utraque cardinis parte et in natibus striis elevatis rugosis, figuraque a præcedente distincta. Valvulæ intus striis radiantibus, subtilissimus notantur. Cætera uti in præcedente. Epidermide remota margaritacea evadit.

*Hab.* Rivers of Coromandel.

The species has a wide range and is represented in the Indian Museum Collection by a long series of specimens, definite localities for which are as follows:—Garchiroti Tahsil: River Dukkaree near Umballa; Ceylon; Sewan, close to the Indus; Gudur, Madras Presidency; Manbhoom; Patna; Berhampore; Murshidabad District; Brahmapuri Tahsil; Bangalore; Phenchooganj, Sylhet; Singpal Garki, Nepal; Arrah, Assam.

As the original description is short and somewhat inadequate, the following taken from the 'Conchologia Iconica' may be of interest:—Testa parva, viridi, subventricosa, magis minusve ovali, vix inæquilaterali, lævigata, paucis autem linearibus obliquis nates

versus eminentes subradiata; margine dorsali vix declivi, antice concavo; margine ventrali convexo; lunula distincta margarita albida, dentibus cardinalibus validis, laciniatis, haud laminatis.

Shell small, green, subventricose (but varying in shape from elliptic to rounded oval), scarcely inequilateral, smooth, except near the prominent beaks, which are adorned with somewhat radiating, oblique, linear ridges; dorsal edges not much sloping, the front one concave; ventral margin convex; lunule well marked, nacre nearly white, cardinal teeth strong, jagged, not lamellar.

No dimensions being given in either of the above descriptions the following are taken from three specimens in the Indian Museum collection; No. 1 being a specimen from the River Dukaree, and Nos. 2 & 3 from Ceylon:—

	1.	2.	3.
Long. ....	32.5	24.5	20.75 mm.
Lat. ....	42.75	36	28 mm.
Diam. ....	19.25	17.5	14.25 mm.

Var. *fragilis*, H. & T., C. I. p. 21, pl. 45, fig. 4.

Presumably a thin form.

Long. 29, lat. 41 mm.

Var. *lævirostris* (Benson); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 842.

*Unio lævirostris*, Benson, A. M. N. II. x, 1862, pp. 191-192; Blanford, J. A. S. B. Calcutta, xxxv, 1862, p. 144.

*Unio corrugatus*, var. *lævirostris*, H. & T., C. I. 1876, p. 21, pl. 44, figs. 5-6.

*Original description*:—Testa transverse oblonga, subovata, valde inæquilaterali, crassiuscula, medio subtumida, antice superne breviter angulata, deinde rotundata, postice superne sensim convexe descendente; demum rotundata, margine ventrali convexiusculo; disco læviusculo, concentrice leviter striato; epidermide olivaceo-viridi, fusco fasciata; umbonibus convexis, decorticatis, obsolete radiato-sulcatis, apicibus prominentibus, approximatis; lunula impressa, elliptica; ligamento elongato; dentibus cardinalibus brevibus, crassiusculis, eroso-sulcatis, later-alibus subobliquis, elongatiusculis, rectis, utriusque valvæ duplicibus; margarita colore salmonis vix tincta.

Long. 28, lat. 50, diam. 20 mm.

*Hab.* Streams and ponds near Chunár above Benares; represented in the Indian Museum collection by localized specimens from the Chittagong Hills, Sudiya and Arrah.

Benson's description is supplemented by a short note from which the following quotation is taken:—"It has two indistinctly raised dark rays on the posterior slope. The gradually compressed

form of the hinder edge of the shell contrasts strongly with the inflated form of the central portion. Anterior and posterior cicatrices confluent, apical ones under the cardinal tooth."

The variety sometimes attains a considerable size, a specimen in the Indian Museum collection from the Chittagong Hills having the following dimensions:—

Long. 43.25, lat. 70, diam. 27 mm.

Var. *nagpoorensis* (Lea); Simpson, Washington, DC., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 842; H. & T., C. I. p. 21, pl. 45, fig. 3.

*Unio nagpoorensis*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iii, 1859, p. 331; Journ. Acad. Nat. Sci. Philadelphia, iv, 1860, p. 270, pl. 45, fig. 150; Obs. Genus *Unio*, vii, 1860, p. 88, pl. 45, fig. 150; Blanford, J. A. S. B. xxxv, 1866, p. 143.

*Margaron (Unio) nagpoorensis*, Lea, Syn. 1870, p. 38.

*Unio corrugatus*, Mull., var. *nagpoorensis*, H. & T., C. I. 1876, p. 21; Pætel, Conch. Sam. 1890, p. 149.

*Original description*:—Testa lævi, subtriangulari, subinflata, inæquilaterali, postice biangulata, antice rotunda; valvulis subtenuibus, antice crassioribus; natibus prominentibus, epidermide rufo-fusca, striata eradiata, dentibus cardinalibus parvis, compressis, obliquis, crenulatis, in utroque valvulo duplicibus; lateralibus longis, lamellatis curvisque; margarita salmonis colore paulisper tincta et iridescente.

*Hab.* Ambajari Tank, Nagpoor, Bengal (*C. M. Wheatley*).

Specimens in the Indian Museum Collection are localized as follows:—Poona; Gudur; Madras Presidency (*G. H. Tipper*); Godavery River.

The dimensions of an average specimen are: long. 30, lat. 46, diam. 22.75 mm.

## 291. *Parreysia* (*Parreysia*) *wynegungaensis* (Lea).

*Parreysia (Parreysia) wynegungaensis* (Lea); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 842.

*Unio wynegungaensis*, Lea, Proc. Acad. Nat. Sci. Philadelphia, 1859 (1860) p. 331; Obs. Genus *Unio*, vii, p. 89, pl. 45, fig. 151; Blanford, J. A. S. B. xxxv, 1866, p. 143; Sowerby, Conch. Icon. xvi, 1868, pl. 67, p. 339; Pætel, Conch. Sam. iii, 1890, p. 172.

*Margaron (Unio) wynegungaensis*, Lea, Syn. 1870, p. 50.

*Original description*:—Testa lævi, elliptica, inflata, inæquilaterali, postice sub-biangulata, antice oblique rotundata; valvulis subcrassis, antice crassioribus; natibus prominentibus, ad apices valde divaricate undulatis; epidermide luteo-oliva, micante, obsolete radiata; dentibus cardinalibus subcrassis, suberectis, valde crenulatis, in utroque valvulo duplicibus; lateralibus sublongis, crassis subrectisque; margarita salmonis colore paulisper tincta et iridescente.



*Hab.* Wynegunga River, 30 miles east of Nagpoor, in the Deccan, Bengal (*C. M. Wheatley*).

The following localities are attached to specimens in the Indian Museum Collection:—Damuda (*W. T. Blanford*); Surat; Sambalpur; Godavery River (*W. T. Blanford*); Barod, about 130 miles S.W. of Sepree.

The dimensions of three average specimens are as follows:—No. 1 being those of the specimen figured by Hanley in the 'Conchologia Indica,' and now in the British Museum Collection.

	1.	2.	3.
Long.....	29	33·25	36 mm.
Lat. ....	42	51	55 mm.
Diam. ....	17·25	19·5	21 mm.

## 292. *Parreysia* (*Parreysia*) *favidens* (*Benson*).

*Parreysia* (*Parreysia*) *favidens* (*Benson*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, pp. 842-843.

? *Mya spuria*, Wood, Ind. Test. 1825, p. 12, pl. 2, fig. 35 a.

*Unio favidens*, Benson, A.M.N.H. x, 1862, p. 188; J.A.S.B. xxxv, 1867, p. 138; H. & T., C. I. 1876, p. 6, pl. 11, fig. 1; Reeve, Conch. Icon. xvi, 1865, pl. 26, fig. 131; Pætel, Conch. Sam. iii, 1890, p. 152.

*Margaron* (*Unio*) *favidens*, Lea, Syn. 1870, p. 38.

*Unio flavidens*, Pætel, Conch. Sam. iii, 1890, p. 152.

*Unio trirostris*, Musgrave, Hanley, Phot. Conch. 1863, pl. 2, fig. 9; H. & T., C. I. 1876, p. 6, pl. 11, fig. 6; Pætel, Conch. Sam. iii, 1890, p. 170.

*Unio tripartitus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, vii, 1863, p. 190; Journ. Acad. Nat. Sci. Philadelphia, vi, 1866, p. 57, pl. 19, fig. 55; Lea, Obs. Genus *Unio*, xi, 1867, p. 61, pl. 19, fig. 55.

*Margaron* (*Unio*) *tripartitus*, Lea, Syn. 1870, p. 35.

*Unio smaragdites*, Benson, A.M.N.H. x, 1862, p. 190; Blanford, J.A.S.B. xxxv, 1866, p. 147; H. & T., C. I. 1876, p. 5, pl. 10, fig. 5; Pætel, Conch. Sam. iii, 1890, p. 167.

*Original description*:—Testa transverse ovata, inæquilaterali, crassa, subtumida, antice rotundata, postice subalata, declivi, angulata, demum obtusa, margine ventrali convexiusculo; disco inæqualiter sulcato; epidermide olivaceo-fusca, versus marginem ventralem luteo-olivacea, postice viridi parce fasciata; umbonibus tumidis, prominentibus, decorticatis, sulcis radiatis angulato-flexuosis indutis; lunula impressa, elliptica, decorticata; ligamento elongato; carina umbonali læviuscula, linea unica vix elevata notata; dentibus cardinalibus crassis, fortiter radiatorugosis, lateralibus obliquis, elongatiusculis, valvæ dextræ duplicibus, sinistræ subtriplicibus; margarita pallide lutea iridescente.

Long. 45, lat. 66, diam. 30 mm.

*Hab.* Upper Ganges.

The anterior and posterior cicatrices are distinct, the apical ones disposed on the underside of the cardinal tooth.

Taken by the author of the species at Bhitoura, between Cawnpore and Allahabad and represented by specimens in the Indian Museum Collection from the following localities:—Moradabad; River Indus; Barrack River; Silcher; Rajputana; Berhampur; Dacca; E. Cachar; Sylhet; Tezpore; Poona; Karnul, Madras; Calcutta (*J. Wood-Mason*); Arrah; Rajmahal; Hazrapur; Rani-gunga; Sunderbunds.

An enormously variable species, of which many varieties have been described, several of these appear, however, to be somewhat obscure; the original descriptions are nevertheless given below:—

**Var. *marcens* (*Benson*),** A. M. N. H. x, 1862, p. 188.

*Unio marcens*, H. & T., C. I. 1876, p. 19, pl. 42, figs. 4-6.

*Original description*:—Banded with olive and green; nacre salmon-coloured; beaks nearly smooth, eroded; sulci obsolete; lunule narrow.

Long. 44, lat. 66, diam. 27 mm.

*Hab.* Berhampooter River, Assam.

**Var. *trigona* (*Benson*).**

*Unio favidens*, var. *densa*, A. M. N. H. x, 1862, p. 188.

*Original description*:—Shell with a piceous epidermis, more oblique; beaks and nacre as in type; lunule broad. It shows an inclination to verge towards *U. triembolus*.

Long. 44, lat. 67, diam. 27 mm.

*Hab.* Nujeebabad, in the North-west of Rohilkund.

**Var. *densa* (*Benson*).**

*Unio favidens*, var. *densa*, A. M. N. H. x, 1862, p. 189.

*Original description*:—More solid and tumid [than the typical form]; epidermis yellow-brown, eroded; lunule as in type; shell more oblique.

Long. 33, lat. 47, diam. 24 mm.

*Hab.* Ganges River, above Chunár, between Allahabad and Benares.

**Var. *deltæ* (*Benson*).**

*Unio favidens*, var. *deltæ*, A. M. N. H. x, 1862, p. 189; H. & T., C. I. 1876, p. 19, pl. 42, fig. 2.

*Original description*:—Epidermis olive-green and yellow, rayed; nacre salmon-coloured; rugæ on umbones very distinct, some also on the upper part of the umbonal hinder slope; lunule somewhat broader than in the type; cardinal teeth narrower.

Long. 34, lat. 47, diam. 24 mm.

*Hab.* River Jellinghy, Upper Gangetic Delta. Also recorded in the Indian Museum Collection from Hazrapur and Calcutta.

**Var. *chrysis* (Benson).**

*Unio favidens*, var. *chrysis*, Benson, A. M. N. H. x, 1862, p. 189 ;  
H. & T., C. I. 1876, p. 19, pl. 41, fig. 3.

*Original description*:—Longer and less broad in proportion ; epidermis a beautiful green, banded more or less with yellow ;

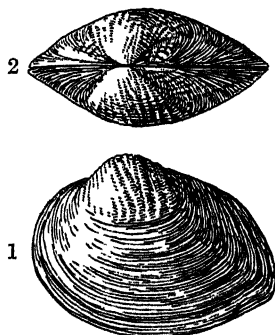


Fig. 10.—*Parreysia* (*P.*) *favidens* (Bens.), var. *chrysis* (Bens.).  
(Specimen.) Nat. size.

umbonal rugæ very strong and extended ; cardinal teeth mostly narrower than in the type ; nacre salmon-tinted.

Long. 27, lat. 35, diam. 16 mm.

*Hab.* River Dojora at Kareily Ghát, near Bareilly. A specimen in the Indian Museum is labelled Patna.

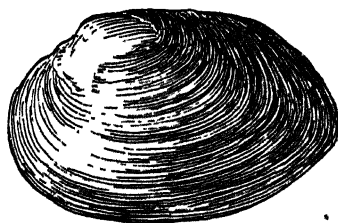


Fig. 11.—*Parreysia* (*P.*) *favidens* (Bens.), var. *viridula* (Bens.).  
(Specimen.) Nat. size.

**Var. *viridula* (Benson).**

*Unio favidens*, var. *viridula*, Benson, A. M. N. H. x, 1862, p. 189.

*Original description*:—Form of type, but more compressed ;

colour as in the last; cardinal teeth broad; nacre bluish white; umbonal rugæ as in var. *chrysis*.

Long. 27, lat. 40, diam. 17 mm.

*Hab.* Standing water, or "jheel," between Hameerpore and Someerpore, Bundelkhund.

Indian Museum specimens are from Damuda; Manbhoom; Gunduk, Ranigunga and Patna.

Var. *assamensis* (*Nevill MS.*), *Preston*, Rec. Ind. Mus. Calcutta, vii, 1912, p. 299.

Shell more convex than the typical form, the dorsal margin rather less posteriorly angled, the anterior side is more rounded and the posterior slightly more nasute.

*Hab.* Dihong.

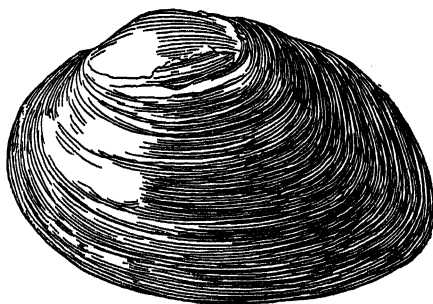


Fig. 12.—*Parreysia* (*P.*) *favidens* (Bens.), var. *assamensis*, Preston.  
(Type) Nat. size.

Specimens in the Indian Museum are also labelled as follows:—Assam; Arrah; Sylhet.

Type in Indian Museum, Calcutta.

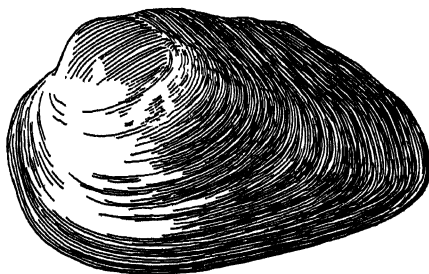


Fig. 13.—*Parreysia* (*P.*) *favidens* (Bens.), var. *pinax* (Bens.).  
(Type) Nat. size.

Var. *pinax* (*Benson*).

*Unio pinax*, Benson, A. M. N. H. x, 1862, p. 192.

*Unio favidens*, var. *pinax*, H. & T., C. I. p. 6, pl. 11, fig. 2.

*Original description*:—Testa transverse oblonga, suboblique

ovata, valde inæquilaterali, crassa, subinflata, antice rotundata, postice superne sensim descendente, demum obtusa, margine ventrali convexiusculo, postice vix emarginato; disco læviusculo, concentricè leviter striatulo, antice obsolete radiato-striato, versus marginem ventralem et posteriorem plicato; epidermide olivaceo-fusca; umbonibus convexis, decorticatis, obsolete radiato-sulcatis, apicibus prominentibus obtusis, remotiusculis; lunula elongato-elliptica; ligamento brevi; dentibus cardinalibus crassioribus, radiatim eroso-sulcatis, lateralibus obliquis, utriusque valvæ duplicibus, subflexuosis; margarita albida, iridescente.

Long. 30, lat. 48, diam. 21 mm.

Anterior cicatrices subconfluent, posterior entirely so, apical ones under the cardinal tooth; cavity of the beaks very deep.

*Hab.* Gungun River, near Moradabad, Rohilkhund. Specimens in the Indian Museum from Arrah.

A very distinct cuneiform variety.

*Var. plagiosoma* (Benson).

*Unio plagiosoma*, Benson, A. M. N. II. x, 1862, p. 191.

*Unio favidens*, var. *plagiosoma*, H. & T., C. I. 1876, p. 6, pl. 11, fig. 3.

*Original description*:—Testa transverse trigono-ovata, inæquilaterali, crassiuscula, tumidiuscula, antice rotundata, postice subconvexe declivi, demum obtusa, margine ventrali convexiusculo; disco obsolete plicato, epidermide luteo-olivacea vel olivaceo-fusca; umbonibus convexis, prominentibus, decorticatis, angulatim

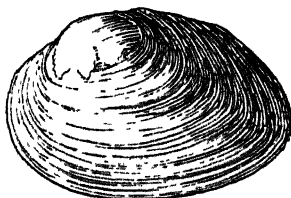


Fig. 14.—*Parreysia* (*P.*) *favidens* (Bens.), var. *plagiosoma* (Bens.).  
(Type.) Nat. size.

flexuoso-sulcatis, apicibus prominentibus subremotis; ligamento brevi; carina umbonali obtusa; lunula elliptica; dentibus cardinalibus crassiusculis, radiatim eroso-sulcatis, lateralibus subelevatis, modice elongatis, obliquis, valvæ sinistræ duplicibus, dextræ simplicibus: margarita colore salmonis tineta.

Long. 26, lat. 39, diam. 18 mm.

“ 22, „ 32, „ 15 mm.

“The anterior cicatrices, as well as the posterior, are subconfluent, the apical ones situated on the underside of the cardinal teeth. The nacre is very iridescent posteriorly. A dark

raised line borders the inner side of the umbonal slope, which exhibits a few rugæ at the upper part."

*Hab.* Cane River, near Banda, Bundelkhund. Specimens in the Indian Museum are labelled as follows:—Patna; Langlai; Alipur, Calcutta (*Dr. J. Anderson*), Beerbhoom (*J. Wood-Mason*).

### 293. *Parreysia* (*Parreysia*) *smaragdites* (*Benson*).

*Parreysia* (*Parreysia*) *smaragdites* (*Benson*); Simpson, Washington D.C., Nat. Mus. Proc. xxii, 1900, p. 843.

*Unio smaragdites*, *Benson*, A. M. N. H. x, 1862, p. 190; *Blanford*, J. A. S. B. xxxv, 1866, p. 147; *H. & T.*, C. I. 1876, p. 5, pl. 10, fig. 5; *Pætel*, Conch. Sam. iii, 1890, p. 167.

*Original description*:—Testa transverse ovato-rhomboides, inæquilaterali, crassiuscula, tumida, antice rotundata, postice alata, recta, tum valde declivi, demum subangulata, margine ventrali convexo; disco lævigato, polito, vix striatulo, sub epidermide pulchre viridi tenuissima obscure radiata albo, margine lutescente; umbonibus prominentibus, apicibus approximatis, subdecorticatis, margaritaceis, breviter et minute radiato-sulcatis; lunula angusta, elongata, transverse rugata; ligamento subelongato; carina umbonali prominente obtusiuscula, areola versus apicem depressiuscula, viridi obscure radiata; dentibus cardinalibus duplicibus, subangustis, rugosis, lateralibus curvatis elongatiusculis, valvæ dextræ simplicibus, sinistræ duplicibus, nonnunquam subtrilicibus: margarita albida, nonnunquam luteo tincta.

Long. 31, lat. 42, diam. 20 mm.

The above description is amplified by the following note:—

"Remarkable for the smoothness of the beautiful green epidermis, which is very thin, and, when rubbed off, exhibits a plain white colour, not nacreous, underneath. The anterior cicatrices are confluent, the posterior nearly distinct, the apical ones situated under the cardinal teeth. Cavity of beaks very deep; a few rugæ cross the striæ on the posterior slope. In general characters it approaches most nearly to the *Jellinghy* variety (*deltæ*) of *U. [P. (P.)] favidens*, which has a more tumid ovate form, a regular, sulcate, olivaceous surface, longer and distinctly angulate-flexuous umbonal furrows, and a broad lunule."

*Hab.* Berhampooter River, Assam (*Col. Jenkins*).

There is a fine series of this interesting form in the collection of the Indian Museum bearing the Burmese localities, Bhamo and Zayleyman (*Dr. J. Anderson*).

### 294. *Parreysia* (*Parreysia*) *bhamoensis* (*Theobald*).

*Parreysia* (*Parreysia*) *bhamoensis* (*Theobald*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 483.

*Unio bhamoensis*, *Theobald*, J. A. S. B. xlii, 1874, pt. 2, p. 207, pl. 17, fig. 1; ? *Hanley & Theobald*, Conch. Ind. 1876, p. 62, pl. 155, fig. 2; *Pætel*, Conch. Sam. iii, 1890, p. 146.

*Unio mandalayensis*, Theobald, J. A. S. B. xlii, 1874, p. 208, pl. 17, fig. 2; H. & T., C. I. 1876, p. 62, pl. 154, fig. 4; Pætel, Conch. Sam. iii, 1890, p. 158.

*Original description*:—Testa subtriangulato-ovata, postice acuminata, margine ventrali modice rotundato, umbonibus tumidiusculis, lævigatis, pustulis parvis aliquando armatis, decorticatis. Epidermide tenuissima, lævi, subpolita, læte viridi, in senioribus flavescente. Testa concentrice subrugata, lineis paucis sive rugis angustis ligamentum versus plus minusve subradiatim notata, et antice rugis paucis perbrevibus leviter corrugata. Dentibus cardinalibus lamellatis, et denticulatis, in valva dextra singulo, multifisso, in sinistra gemino, posteriore triangulari et umbonem juxta posito, anteriore lamelliformi, striato. Nacrea argentea et viridescente.

Long. 40, lat. 52, diam. 26 mm.

*Hab.* Near Bhamo; Pegu, Western Prome.

To Theobald's description the following is appended:—

"A rare species in Western Prome where alone I have met with it in Pegu, and remarkable for its smooth thin epidermis. The posterior slope alone is conspicuously ornamented with sculpture; but in my largest specimen from Bhamo and in some others also, the peculiar sculpturing of *U. [P. (P.)] burmanus*, W. Blfd., is faintly but distinctly perceptible over part of the valves towards the umbones especially."

295. *Parreysia (Parreysia) pernodulosa*, Preston.

*Parreysia (Parreysia) pernodulosa*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 300.

*Original description*:—Shell small, ovate, dark brown; both valves sculptured anteriorly with coarse, corrugate ridges, which

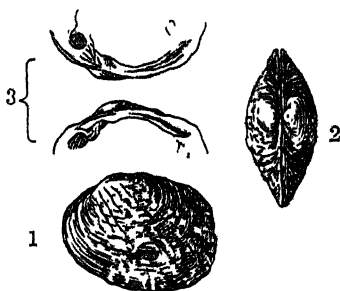


Fig. 15.—1 & 2. *Parreysia pernodulosa*, Preston. (Type.) Nat. size.  
3. Hinge of same.

become more nodulous and irregular in the median and posterior regions; umbones rather large; dorsal margin rapidly sloping anteriorly, slightly sloping posteriorly; ventral margin somewhat

rounded; anterior side rather contracted, sharply rounded; posterior side broad, very gently rounded; cardinal teeth very anteriorly situate, in right valve squarish, bearing two elongate grooves, in left valve large, jagged, split into three portions, between each of which occur two deep notches, the middle portion, or that between the two notches, being by far the smallest, at the base of the anterior portion is situated a smaller, jagged tooth, which is obliquely grooved in the centre; lateral teeth in both valves posteriorly, elongately arched, grooved down the whole length; anterior scars very deep; posterior scar elongate, but not well marked; interior of shell pale bluish, nacreous.

Long. 15.5, lat. 20.5 mm.

*Hab.* Zayleyman, Upper Burma (*Dr. J. Anderson*).

Type in the Indian Museum Collection.

296. *Parreysia* (*Parreysia*) *feddeni* (*Theobald*).

*Parreysia* (*Parreysia*) *feddeni* (*Theobald*); Simpson, Washington, D.C., Smiths Inst., Nat. Mus. Proc. xxii, 1900, p. 848.

*Unio feddeni*, *Theobald*, J. A. S. B. xlii, 1874, p. 208, pl. 17, fig. 3.

*Original description*:—"Testa quadrato-ovali, concentrice sulcata, antice gibbose rotundata, postice dilatata, subtruncata; parum inæquilaterali. Umbonibus decorticatis haud prominentibus. Epidermide lævi, subpolita, viridescenti-flava. Dentibus cardinalibus lamelliformibus, striatis; in valva dextra singulo, serrato, in sinistra geminis triangularibus, striatis et serratis. Nacreæ cærulescenti-albida.

Long. 29.5, lat. 40, diam. 19 mm.

*Hab.* Peemungunga, Central India (*F. Fedden*); there are specimens also in the British Museum and in the Indian Museum from the same locality, the latter collected by the late Dr. W. T. Blanford.

297. *Parreysia* (*Parreysia*) *daccaensis*, *Preston*.

*Parreysia* (*Parreysia*) *daccaensis*, *Preston*, Rec. Ind. Mus., Calcutta, vii, 1912, p. 300.

*Original description*:—"Shell differing from *P. feddeni*, *Theobald*, in its larger size, more ponderous form and more elongately ovate shape, it is much darker in colour, being of a dark blackish-brown instead of the greenish-yellow shade of that species, the shell is much more coarsely concentrically striate and is also considerably malleated, while *P. feddeni* is almost smooth in texture; the umbones in the present species are, though larger, far less prominent, but the system of the hinge-teeth is the same.

Long. 47, lat. 76.5, diam. 29 mm.

*Hab.* Dacca.

The type specimen is in the Indian Museum.



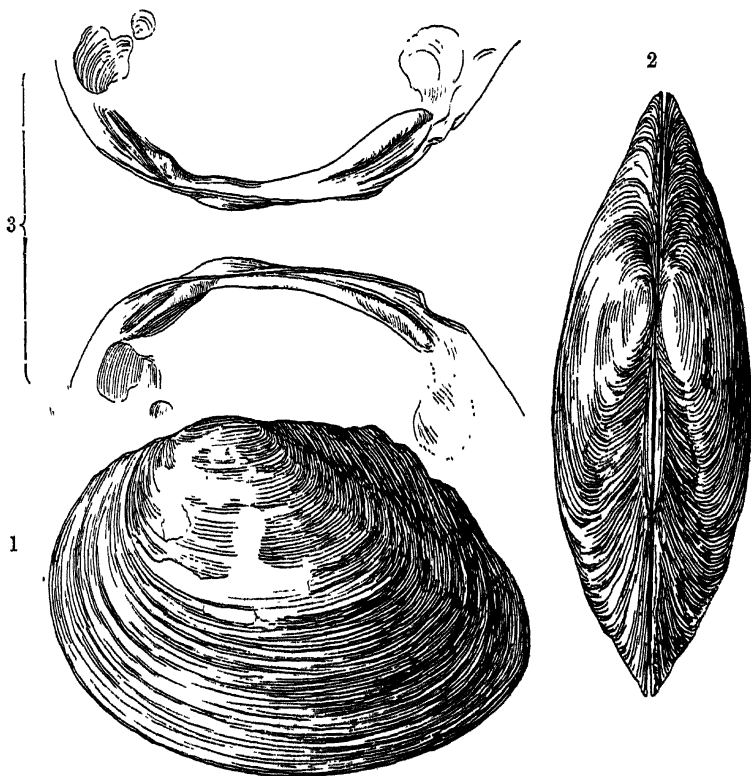


Fig. 16.—1 & 2. *Parreysia* (*P.*) *daccaensis*, Preston. (Type.) Nat. size.  
3. Hinge and muscular scars of same.

298. *Parreysia* (*Parreysia*) *tavoyensis* (Gould).

*Parreysia* (*Parreysia*) *tavoyensis* (Gould); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 843.

*Unio tavoyensis*, Gould, Proc. Boston Soc. Nat. Hist. i, 1843, pp. 140-141; Catlow & Reeve, Conch. Nom. 1845, p. 64; Küster, Conch.-Cab., *Unio*, 1856, p. 166, pl. 48, fig. 2; Gould, Otia Conch. 1862, p. 190; Reeve, Conch. Icon. xvi, 1864, pl. 13, fig. 49; Blanford, J. A. S. B. xxxv, 1868, p. 148; H. & T., C. I. 1876, p. 62, pl. 154, fig. 6, 7; Pætel, Conch. Sam. iii, 1890, p. 169.

*Margarona* (*Unio*) *tavoyensis*, Lea, Syn. 1870, p. 31.

*Unio savoyensis*, Pætel, Conch. Sam. iii, 1890, p. 166.

*Unio parva*, Benson; Sowerby, Conch. Icon. xvi, 1868, pl. 95, fig. 514; H. & T., C. I. 1876, p. 61, pl. 154, fig. 1; Pætel, Conch. Sam. iii, 1890, p. 162.

*Original description*:—Testa rotundata, solida, sub-equilaterali, fusca, postice dilatata, subangulata; umbonibus elevatis, una cum

latere postico corrugatis; dentibus cardinalibus pyramidatis, lateralibus flexuosis: impressionibus musculorum profundis; margarita albido-incarnata.

Long. 38, lat. 51, diam. 20 mm.

*Hab.* Tavoy; also recorded in the Indian Museum from the following Burmese localities: Pegu, Arakan, Tenasserim, and Mandalay.

**Var. *triembolus* (Benson).**

*Unio triembolus*, Benson, J. A. S. B. xxxv, 1855, p. 44; id. A. M. N. H. x, 1862, p. 190; H. & T., C. I. 1876, p. 43, pl. 107, fig. 2; Pætal. Conch. Sam. iii, 1890, p. 170.

*Unio houngdaranicus*, Tapparone-Canefri, Ann. Mus. Civ. St. Nat. Genova, vii, 1889, p. 341.

*Original description*:—A thick shell with large teeth. A massive species which inhabits the Nerbudda, and the shells of which are found fossil associated with the bones of extinct mammalia in the gravels of the river valley, may be a variety of this species [*P. tavoyensis*].

The author writing in the 'Annals & Magazine of Natural History,' in 1862, further describes his species.

Testa oblique rhomboidali, subtrigona, transversa, inæquilaterali, crassa, antice brevi rotundata, postice subalata, descendente, demum angulata, obtusa, margine ventrali convexo; disco transverse plicato et striato, piceo-nigrescente; umbone tumido, gibboso, versus apices remotos obtusos decorticatos iridescentes radiato-sulcato, carina umbonali obtusa; dentibus cardinalibus crassissimis, corrugatis, lateralibus obliquis, valva dextræ duplicibus, sinistræ triplicibus; margarita albida vel colore salmonis tincta.

The dimensions of three specimens given at the end of Benson's description are as follows:—

	1.	2.	3.
Long.....	47	45	44 mm.
Lat. ....	57	62	63 mm.
Diam.....	27	27	30 mm.

*Hab.* Ranigunga, near Moradabad. Specimens in the Indian Museum are labelled Cachar; Barrack River, Silchar, and Calcutta.

The author also mentions that he obtained the following variations of this form:—

- (1) Smaller, and more trigonal. River Goomty.
- (2) Smaller, obliquely elongated. River Goomty.
- (3) Green and olive in colour. River Dojora, near Bareilly.
- (4) Gibbous. River Gungut, near Monghyr, in Bahar.

The following note is given with reference to the description of the typical form:—"The anterior and posterior cicatrices are distinct, the latter particularly so; the apical cicatrices are indistinct on the inner side of the cardinal tooth; cavity of the

beaks very deep and angular. . . . The green Dojora variety is remarkable for the great development of the teeth. The lateral ones are disposed to be treble in the right as well as in the left valve; and several parallel plicæ intervene between them and the exaggerated cardinal teeth in a perfect specimen with the following dimensions: Long. 37, lat. 50, diam. 23 mm."

299. *Parreysia* (*Parreysia*) *vulcana* (*Hanley*).

*Parreysia* (*Parreysia*) *vulcana* (*Hanley*): Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 844.

*Unio vulcanus*, Hanley, P. Z. S. 1875, p. 606; H. & T., C. I. 1876, p. 62, pl. 155, fig. 3; Pætel, Conch. Sam. iii, 1890, p. 172.

*Original description*:—Testa solida, inæquilateralis, subovata, viridis, undique (nisi fortasse ad extremitatem anticam) plicato-rugosa; plicæ (seu tubercula elongata confluentia) undatim angulariter et oblique ordinatæ. Margo dorsalis posticus et margo ventralis convexi, subparalleli. Costa umbonalis nulla; area postica nequaquam concava. Lunula lata, haud multum impressa. Margarita alba, vix minime iridescens. Margo cardinalis latus; dentes cardinales solidi, lacerati; in valvula sinistra dens lateralis inter duos valvulæ dextræ insertus.

Long. 25, lat. 38 mm.

*Hab.* Burma.

Described from an isolated specimen and appearing to somewhat resemble *P. tavoyensis* (Gld.), in form.

To the description the following note is appended:—

" . . . When held before a light the valves appear of a yellowish green, richly embossed with zigzag ridges of a darker or bluer verdure. The hinge is nearly the same as in *U.* [*P. (P.)*] *favidens* of Benson, the central teeth being short and complicated."

300. *Parreysia* (*Parreysia*) *feæ* (*Tapparone-Canefri*).

*Parreysia* (*Parreysia*) *feæ* (*Tapparone-Canefri*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 844.

*Unio feæ*, Tapparone-Canefri, Ann. Mus. Civ. St. Nat. Genova, xxvii, 1889, p. 340.

*Original description*:—Testa solida, crassiuscula, subcordato-ovata, inæquilaterali, postice attenuata, margine ventrali subarcuato postice sinuato, umbonibus tumidiusculis, decorticatis. Valvæ rugis concentricis profundis 3-4-5 sæpius exaratae, epidermide luteo olivacea, tenui, lævi indutæ, umbonibus præsertim et latere postico in junioribus varie ex læte-viridi depictis et fulgurato-corrugatis. Dentes cardinales crassi, subtrigoni, laciniati et striati, dentibus in valva dextera unico, in sinistra duplici, postico majori triangulari, antico-oblongo minori. Margarita læte carnea.

Long. 42-43, lat. 55, diam. 25-29 mm.

*Hab.* Meetan, Hougndaran River (*L. Fea*).

301. *Parreysia* (*Parreysia*) *rajahensis* (Lea).

*Parreysia* (*Parreysia*) *rajahensis* (Lea); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 844.

*Unio rajahensis*, Lea, Philadelphia, Pa., Proc. Amer. Phil. Soc. ii, 1841, p. 30; Philadelphia, Pa., Trans. Amer. Phil. Soc. viii, 1842, p. 239, pl. 23, fig. 53; Obs. Genus *Unio*, iii, 1842, p. 77, pl. 23, fig. 53; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 495; Chenu, Ill. Conch. 1858, pl. 26, figs. 3, 3 a, 3 b; Pætel, Conch. Sam. iii, 1890, p. 165.

*Margaron* (*Unio*) *rajahensis*, Lea, Syn. 1852, p. 25; 1870, p. 38.

*Unio indicus*, Sowerby, Conch. Icon. xvi, 1866, pl. 40, fig. 222; H. & T., C. I. 1876, p. 43, pl. 107, fig. 1.

*Margaron* (*Unio*) *indicus*, Lea, Syn. 1870, p. 31,

*Original description*:—Testa triangulari, inflata, inæquilaterali, postice angulata; valvulis crassis; natibus valde prominentibus; epidermide tenebroso-fusca; dentibus cardinalibus magnis: later-alibus sublongis curvisque; margarita alba et valde iridescente.

*Hab.* The Rajah's tanks, Calcutta (*Dr. Jay*). The species in the Indian Museum is represented by specimens from Poona; Ner-budda River (*W. Theobald & W. T. Blanford*); "From the soil of the Ran Kach"; "From 130 miles S.W. of Sepree"; Sahibgunga.

Three specimens from the Nerbudda River yielded the following dimensions:—

	1.	2.	3.	
Long. ....	27.25	28	27	mm.
Lat. ....	31.75	35	31	mm.
Diam. ....	16	19	16.25	mm.

302. *Parreysia* (*Parreysia*) *rugosa* (Gmelin).

*Parreysia* (*Parreysia*) *rugosa* (Gmelin); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 844.

*Mya rugosa*, Gmelin, Syst. Nat. 13th ed. 1788, vi, p. 3222; Wood, Gen. Conch. i, 1815, p. 109; Dillwyn, Cat. i, 1817, p. 53; Wood, Ind. Test. 1825, p. 12, pl. 2, fig. 33 a; rev. ed. 1856, p. 16, pl. 2, fig. 33.

*Unio rugosus*, Küster, Conch. Cab., *Unio*, 1862, p. 290, pl. 97, fig. 5; Blanford, J. A. S. B. xxxv, 1867, p. 137; Pætel, Conch. Sam. iii, 1890, p. 166.

*Original description*:—Testa ovali rugosa, extrinsecus virescente, intus margaritacea: cardinis dente primario crenulato, laterali longitudinali, alterius duplicato.

*Hab.* Coromandel.

303. *Parreysia* (*Parreysia*) *corbis* (Hanley).

*Parreysia* (*Parreysia*) *corbis* (Hanley); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 845.

*Unio corbis*, Hanley, Biv. Shells, 1856, p. 386, pl. 23, fig. 43; H. & T., C. I. 1876, p. 22, pl. 45, fig. 10.

*Margaron* (*Unio*) *corbis*, Lea, Syn. 1870, p. 50.

*Original description*:—Shell oval, inequilateral, rather thin,

subventricose, concentrically zoned with bluish green and ochraceous yellow, rather glossy, smooth, except at the umbones, which are adorned with longitudinally divergent slender corrugations, the hinder lines of which incline interiorwards, the front ones posteriorwards; a few similar wrinkles radiate subtransversely thence to the dorsal end of the concave anterior slope; ventral edge convex; front dorsal edge straightish, a little elevated; extremities rounded, the front rather broad; nacre silvery; umbonal cavity ample; teeth laminar, compressed.

Long. 19, lat. 26.5 mm.

*Hab.* Assam.

The species was originally described from a single valve: below are given the dimensions of two specimens in the British and Indian Museums collections respectively:—

	1.	2.
Long. ....	16.75	19 mm.
Lat. ....	25.5	30 mm.
Diam. ....	13	14.75 mm.

The above two specimens are the only ones which the compiler of the present volume has been able to examine: though agreeing in the essential characters with the original description, there are still considerable differences between them: the smaller, or British Museum specimen, being far more obtuse posteriorly than that of the Indian Museum, the dorsal margin of the former gradually sloping upwards posteriorly to a rounded angle, while in the latter this character is not nearly so accentuated.

### 304. *Parreysia* (*Parreysia*) *burmanus* (*Blanford*).

*Parreysia* (*Parreysia*) *burmanus* (Blanford); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 845.

*Unio burmanus*, Blanford, P. Z. S. 1869, pp. 449–450.

*Unio birmanus*, H. & T., C. I. 1876, p. 19, pl. 42, fig. 1; Pætel, Conch. Sam. iii, 1890, p. 146.

*Original description*:—Testa subovata, solida, subcompressa, valde inæquilateralis, picea vel fusco-olivacea, concentricè plicato-striata, disco medio et postico rugis obliquis irregulariter angulatis, interdum granosis, hic illic præsertim versus marginem ventralem obsoletis corrugato; umbonibus non prominentibus, subplanulatis, angulatim corrugatis, haud procul ab extremitate anteriore positis; lunella parva, concava; latere antico brevissimo subacuminato-rotundato; area convexa; margine dorsali postice regulariter convexo-curvato, terminaliter rotundato, ventrali convexo; dentibus cardinalibus crassis, radiatim corrugatis, in valva dextra binis, anteriore minimo, in sinistra ternis vel subternis; lateralibus elongatis subcurvatis, in valva dextra subduplicibus, in sinistra duplicibus; margarita colore salmonis tincta. Testa junior

rotundato-ovalis, omnino præter ad extremitatem anticam sub-radiatim granoso-plicifera.

The dimensions of three specimens given at the foot of the original description are as follows :—

	1.	2.	3 (young shell).
Long. ....	52	45	34 mm.
Lat. ....	35	32	26·5 mm.
Diam. ....	22	20	17 mm.
Length of ligament ....	23	20·5	16 mm.

*Hab.* Irawady River at Bhamo.

The type is in the Indian Museum.

### 305. *Parreysia* (*Parreysia*) *sikkimensis* (Lea).

*Parreysia* (*Parreysia*) *sikkimensis* (Lea); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 845.

*Unio sikkimensis*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iii, 1859, p. 151; Journ. Acad. Nat. Sci. Philadelphia, iv, 1859, p. 251, pl. 39, fig. 131; Obs. Genus *Unio*, vii, 1860, p. 69, pl. 39, fig. 131; Sowerby, Conch. Icon. xvi, 1868, pl. 76, fig. 400; H. & T., C. I. 1876, p. 6, pl. 11, fig. 4, and p. 44, pl. 107, figs. 6, 7; Pætel, Conch. Sam. iii, 1890, p. 167.

*Margaron* (*Unio*) *sikkimensis*, Lea, Syn. 1870, p. 64.

*Original description* :—Testa lævi, obovata, inæquilaterali, sub-inflata, postice obtuse biangulata; valvulis crassiusculis; natibus prominulis; epidermide luteo-fusca, radiata; dentibus cardinalibus parvulis, brevibus crenulatis, in utroque valvulo duplicibus; later-alibus brevibus subcurvisque; margarita alba et iridescente.

*Hab.* Sikkim (*H. Cuning & Prof. Hanley*). Represented in the Indian Museum by specimens from Sibsagar, Assam (*S. F. Peal*); Siliguri; Namtsik; Dihang, and Cachar.

No dimensions being given with the original description, those of three specimens in the Indian Museum are appended :—

	1.	2.	3.
Long. ....	28·5	28·25	19·5 mm.
Lat. ....	38·5	37·25	27·25 mm.
Diam. ....	20	19·25	12·25 mm.

The species though varying somewhat, usually in the posterior region, is easily distinguishable from others of the group by its considerable convexity in proportion to its size and by its short, broad, and generally ovately rounded form.

### 306. *Parreysia* (*Parreysia*) *gowhattensis* (Theobald).

*Parreysia* (*Parreysia*) *gowhattensis* (Theobald); Simpson, Wash-ington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 845.

*Unio gowhattensis*, Theobald, J. A. S. B. xlii, 1873, p. 208, pl. 17, fig. 4; Pætel, Conch. Sam. iii, 1890, p. 154.

*Original description* :—Testa quadrato-ovata, antice rotundata,

postice declive truncata, margine ventrali recto. Umbonibus decorticatis. Epidermide flavescens, postice viridescens. Testa concentricè striata et rugis plurimis minutis valde approximantibus angulariter seu fulgurate granuloso-crispata, postice tantum radiatim granuloso-crispata. Dentibus cardinalibus bifidis in utraque valvo. Nacreæ cærulescenti-albida, iridescente. In senioribus granulationes valde inconspicue fiunt.

Long. 25.5, lat. 39, diam. 18 mm.

*Hab.* Near Gowhatti, Assam.

The sculpture of this species much resembles that of *Nodularia crispisulcata*, Benson.

307. *Parreysia* (*Parreysia*) *perconvexa*, Preston.

*Parreysia* (*Parreysia*) *perconvexa*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 302.

*Original description*:—Shell ovate, slightly curved, very convex, solid but much eroded, where intact covered by a dark blackish-

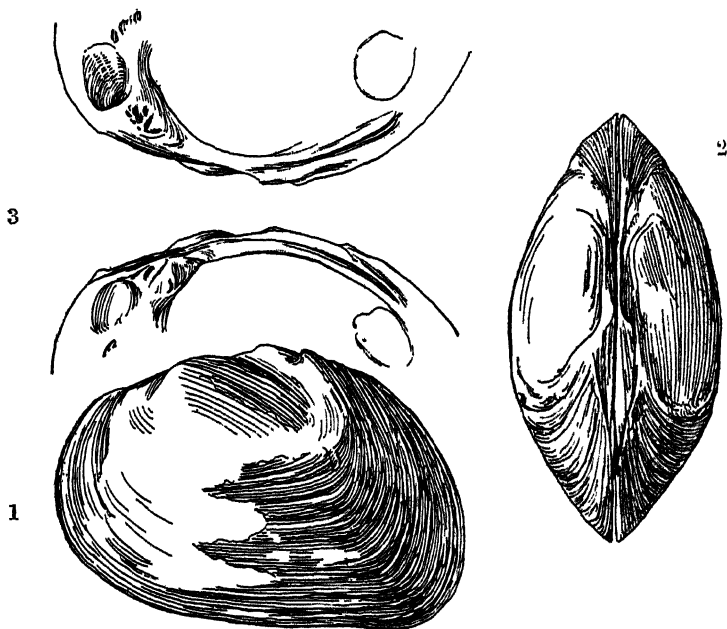


Fig. 17.—1 & 2. *Parreysia* (*P.*) *perconvexa*, Preston. (Type.) Nat. size.  
3. Hinge of same.

brown periostracum; umbones moderately large; dorsal margin sloping in an anterior direction; ventral margin slightly curved

posteriorly; anterior side gently rounded; posterior side slightly and very bluntly produced, rounded; cardinal teeth very anteriorly situate, with upper surface multi-ridged and supported in each valve by an enormous column-like callous thickening of the shell; lateral teeth coarse, rather short, curved; anterior muscular scars of great depth; posterior scars subcircular, well impressed; interior of shell very pale greenish white.

Long. 37, lat. 55, diam. 33 mm.

*Hab.* Nongyang Lake, south of Patkai.

The type is in the Indian Museum.

308. *Parreysia* (*Parreysia*) *annandalei*, *Preston*.

*Parreysia* (*Parreysia*) *annandalei*, *Preston*, *Rec. Ind. Mus.*, Calcutta, vii, 1912, p. 302.

*Original description*:—Shell oval, convex, moderately solid, coarsely concentrically ribbed, covered with a thin, smooth, brownish-olivaceous periostracum; umbones rather small, not

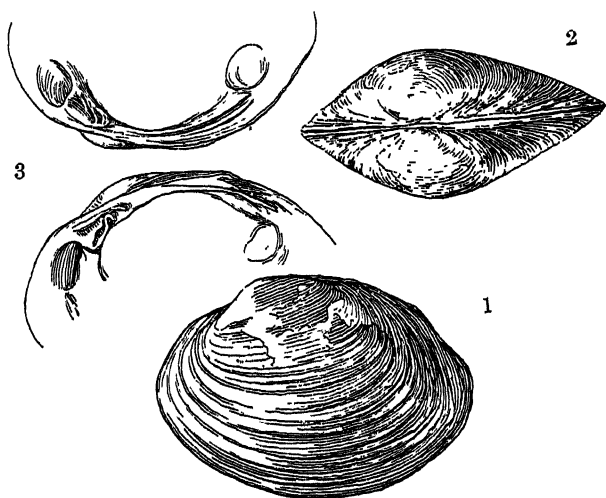


Fig. 18.—1 & 2. *Parreysia* (*P.*) *annandalei*, *Preston*. (Type.) Nat. size.  
3. Hinge of same.

prominent; dorsal margin arched; ventral margin considerably rounded; anterior side slightly produced and rather sharply rounded; posterior side very bluntly subrostrate; cardinal teeth two in each valve, somewhat anteriorly situate, rather coarse and corrugated; lateral teeth strong, curved; anterior scars rather



small, very deeply excavated; posterior scars also small, ovate, deeply impressed; interior of shell whitish iridescent.

Long. 29, lat. 41, diam. 20 mm.

*Hab.* Gowhatty.

The type specimen is in the Indian Museum.

### 309. *Parreysia* (*Parreysia*) *dalliana*, Frierson.

*Parreysia* (*Parreysia*) *dalliana*, Frierson, 'Nautilus,' Boston Mass. xxvi, p. 142; Haas, Martini & Chemnitz, Conch.-Cab. pl. 32, figs. 3, 4 (as *Trapezoideus foliaceus*).

*Original description*:—Shell small, rather thick, somewhat ovate. . . . . Rounded before, basal and dorsal lines nearly straight, post basal point rounded. Epidermis olivaceous, greenish in young shells, brownish in old specimens, and frequently *bleached*. Beaks very small, pointed, low, and incurved, with fine zigzag radial sculpture, which extends a little down the shell, and especially down the post slope; in dirty or eroded specimens hardly to be noticed. The shell is a little inflated, the post ridge rounded. Inside the nacre is soft cream or white. The left valve has two cardinals, the anterior blade-like, and the posterior much smaller and tubercular. The laterals are double (or even inclined to be trifid); in the right valve the cardinals are split or double, and the laterals single. The anterior cicatrices are confluent, and also those of the posterior.

Long. 25, lat. 40 mm.

*Hab.* Burma.

"The shell is stouter, shorter, and more inflated than *T. foliaceus*, and the posterior portion is not green."

### Genus **LAMELLIDENS**.

*Lamellidens*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 854.

*TYPE*, *Unio marginalis*, Lamarck, from India, Burma, and Ceylon.

*Range*. India; Burma; Ceylon and China.

*Original description*:—Shell elongate, elliptical, pointed behind, with a slight post-dorsal wing, a low, often biangulate posterior ridge, and generally two sharp, radiating liræ above it; beaks with curved, radiating ridges which sometimes are slightly zigzag and often become almost concentric, but which fade out as they approach each other at the centre of the disc; epidermis smooth, generally shining, brownish, often with concentric bands of lighter colour, rayless or nearly so; left valve with two compressed pseudo-cardinals, the front one roughened, and two laterals; right valve

with two parallel, lamellar pseudocardinals and one lateral; cavity of the beaks rather shallow; dorsal scars few, deep, distinct, scattered; anterior scars separate; nacre bluish-white to straw.

Animal unknown.

Subgenus **LAMELLIDENS** (*sensu stricto*).

*Lamellidens*, Simpson, Washington, D.C. Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 854.

TYPE, *Unio marginalis*, Lamarck.

Range. India; Burma; Ceylon; China.

Shell dark-coloured; teeth well developed.

310. **Lamellidens marginalis** (Lamarck).

*Lamellidens marginalis* (Lamarck); Simpson, Washington, D.C. Smiths. Inst., Nat. Mus. Proc. xxii, 1900, pp. 854-855; *Die breite Mahler-Muschel aus Grönland*, Schröter, Flussconch. 1779, p. 181, pl. 9, fig. 1.

? *Unio groenlandicus*, Morch, Am. J. Conch. iv, 1868, p. 38.

? *Unio testudinarius*, Spengler, Skriv. Selsk. Nat. iii, 1793, p. 65; Pætel, Conch. Sam. iii, 1890, p. 169.

? *Unio truncatus*, Spengler, Skriv. Selsk. Nat. iii, 1793, p. 65;

? Schröter, Arch. Zool. Zoot. ii, 2 Stück, 1802, p. 107.

*Unio marginalis*, Lamarck, An. sans Vert. vi, 1819, p. 79; Deshayes, Enc. Méth. ii, 1827, p. 151, pl. 247, fig. 1; Hanley, Test. Moll. 1842, p. 206; Hanley, Biv. Shells, 1843, p. 206, pl. 20, fig. 53; Catlow & Reeve, Conch. Nom. 1845, p. 61; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 491; Kuster, Conch. Cab., *Unio*, 1861, p. 239, pl. 80, fig. 4; Sowerby, Conch. Icon. xvi, 1867, pl. 59, fig. 27; H. & T., C. I. 1876, p. 20, pl. 43, fig. 2; Pætel, Conch. Sam. iii, 1890, p. 158.

*Margarita (Unio) marginalis*, Lea, Syn. 1836, p. 37; 1838, p. 24.

*Margaron (Unio) marginalis*, Lea, Syn. 1852, p. 38; 1838, p. 24.

*Unio anodontina*, Lamarck, An. sans Vert. vi, 1819, p. 80; Deshayes, An. sans Vert. vi, 1835, p. 546; ii, 1839, p. 671.

*Unio anodontinus*, Kuster, Conch. Cab., *Unio*, 1861, p. 240, pl. 80, fig. 15; Pætel, Conch. Sam. iii, 1890, p. 144.

*Symphanota bilineata*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. iv, 1831, p. 98, pl. 11, fig. 19; Obs. Genus *Unio*, i, 1834, p. 108, pl. 11, fig. 19.

*Margarita (Unio) bilineatus*, Lea, Syn. 1836, p. 38; 1838, p. 25.

*Unio bilineatus*, Hanley, Test. Moll. 1842, p. 207; Biv. Shells, 1843, p. 207, pl. 21, fig. 30; Catlow & Reeve, Conch. Nom. 1845, p. 56; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 491; Sowerby, Conch. Icon. xvi, 1868, pl. 71, fig. 365.

*Margaron (Unio) bilineatus*, Lea, Syn. 1852, p. 38; 1870, p. 61.

? *Unio evanescens*, Mousson, Moll. Java, 1849, p. 91, pl. 17, fig. 2.

*Original description*:—Testa ovato-oblonga, subrhombea, tenui, intus cærulescente; fasciis transversis marginalibus; dente cardinali parvo compresso.

The above description may be amplified by that given by Sowerby in the 'Conchologia Iconica':—"Shell oblong-ovate, thin, very smooth, somewhat inflated, covered with a blackish-brown shining epidermis, pale iridescent-fawn within; posterior side roundly angular, produced, dorsal margin straight, lateral margin oblique, end subacuminated, ventral margin raised towards the end, very slightly contracted in the middle; anterior side short, narrow, dorsal margin slightly sloped, cuneate; umboes smooth."

The following dimensions are taken from three adult specimens in the collection of the Indian Museum:—

	1.	2.	3.
Long. . . . .	51	50·5	52·5 mm.
Lat. . . . .	100·5	95·25	95 mm.
Diam. . . . .	32	30	34 mm.

The species is very widely distributed throughout India, Burma, and Ceylon, and should Mousson's *Unio evanescens* prove to be really a synonym, then Java must also be added to the above.

Var. *obesa* (Hanley & Theobald); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 855.

*Unio marginalis* var. *obesa*, H. & T., C. I. 1876, p. 20, pl. 43, fig. 3.

*Unio corrianus*, Sowerby, Conch. Icon. xvi, 1868, pl. 77, fig. 401.

The variety is described as follows in the 'Conchologia Indica'— "A giant form, which does not exhibit the ochraceous band, and is peculiarly swollen. . . . . The upper anterior tooth is almost linear; the lateral [teeth] are not bent at the extremity, and the upper one in the left valve is scarcely developed."

The following dimensions are those of three specimens in the Indian Museum. Those of No. 1 are of a specimen from Silchar and those of Nos. 2 and 3 of specimens from Tonghoo:—

	1.	2.	3.
Long. . . . .	67	64	57·5 mm.
Lat. . . . .	118	125	109 mm.
Diam. . . . .	48	44	43 mm.

This inflated variety was originally noticed from the Irrawaddy River; there are, however, specimens in the collection of the Indian Museum which undoubtedly belong to it from Chittagong, Silchar and Toungoo, Burma.

Var. *tricolor* (Kuster); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 855.

*Unio tricolor*, Kuster, Conch. Cab., *Unio*, 1856, p. 156, pl. 45, fig. 1; Jickeli, Faun. Moll. N.O.-Afr. 1874, p. 275; Pætel, Conch. Sam. iii, 1890, p. 170.

*Unio marginalis* var. *tricolor*, H. & T., C. I. 1876, p. 20, pl. 42, fig. 5.

*Original description*:—Testa valde inæquilatera, elliptica, tenera, nitida, modice convexa, obsolete sulcata et subtilissime strigata, olivaceo-fusca, parte inferiore flava; postice læte viridi-radiata; umbonibus depressis; area compressa; dentibus cardinalibus compressis, dextro duplicato, lamellis tenuibus acutis; margarita nitido-cærulescens, subtiliter radiata.

Long. 28·25, lat. 60·5, diam. 17·25 mm.

Küster gives as the habitat of his species "*Ægypten im Nil*," but this must be an error, as the shell he figures is obviously a variety of the Indian *L. marginalis*. It is represented in the Indian Museum collection by specimens from the following localities:—Shuaygoomyo, Burma and Manbhoom, Bengal.

Var. *zonata* (*Deshayes*).

*Unio marginalis*, Desh. *Encycl. Méth.*, Vers ii, p. 587.

*Unio marginalis*, Lk., var. *zonata*, H. & T., C. I. 1876, p. 20, pl. 44, fig. 2.

Shell oval, transverse, inequilateral, thin, covered with a dark brown periostracum interrupted towards the margins by transverse zones of rather pale greenish-yellow; anterior side rounded, obtuse, rather narrower than the posterior side which terminates in a somewhat prominent angle; the dorsal and posterior margins compressed and slightly dilated in the form of a wing, separated towards the umbones by a posterior angle continuing to the top, interior of shell nacreous, rather deep and very bright yellow, tinged with reddish and bluish shades towards the posterior side; hinge very narrow, gently arched, consisting, in the right valve, of an oblong, crested, cardinal tooth roughened on the inner side, crenellated at its free end and bearing on the outward side a small decurrent swelling which limits the cavity into which the tooth of the opposite valve is received; left valve bearing two blunt teeth, of which the posterior, which is the shorter, only commences to rise at the extremity of the other; lateral posterior tooth elongate, arched, narrow, sharp, rough and truncated at its posterior end, fitting between two lamellæ in the left valve which are unequal both in length and height.

Long. 46, lat. 84 mm.

*Hab.* Bengal.

There are specimens which correspond to this description in the Indian Museum collection from Rangoon, the measurements of three of these being as below:—

	1.	2.	3.
Long. ....	39·5	41	36 mm.
Lat. ....	74·5	73	67 mm.
Diam. ....	23	19	23 mm.

Var. *candaharica* (*Hanley & Theobald*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 855.

*Unio marginalis* var. *candaharica*, H. & T., C. I. 1876, p. 20, pl. 43, fig. 4; Hutton, J. A. S. B. xviii, pt. 1, 1849 (1850), p. 660.

*Original description*:—Shell oval oblong, ventricose, tumid not produced nor attenuated behind; beaks flattened and denuded; upper edge rounded or falling; lower edge curved; strongly wrinkled transversely; epidermis olive-brown, in young specimens with broad yellowish margin.

The dimensions of three specimens mentioned by Hutton are:—

	1.	2.	3.
Long. ....	41.25	41.25	44.25 mm.
Lat. ....	75	73	78 mm.

and of two specimens, both from Candahar, in the Indian Museum:—

	1.	2.
Long. ....	37.5	38.25 mm.
Lat. ....	65.5	68.5 mm.
Diam. ....	22.5	24.5 mm.

*Hab.* Candahar, in canals.

Hutton further states that it differs from typical *U. marginalis*, Lk. "..... in the less produced and lengthened form posteriorly, in the upper part of the anterior edge being straighter and more elevated than in *U. marginalis*, and in the beaks being less denuded and more wrinkled. In *Unio marginalis* of the Gangetic Provinces the breadth appears to exceed the length much more considerably than in the Candahar shells, measuring in four specimens of each as follows:—

"Indian [Gangetic Provinces] specimen,

	1.	2.	3.	4.
Long. ....	35	41.25	35	38 mm.
Lat. ....	40	89	80	76.5 mm.

"Afghan specimens,

	1.	2.	3.	4.
Long. ....	16	41.25	41.25	46 mm.
Lat. ....	75	73	75	78 mm.

"The proportions thus appear to be reversed; the Indian species showing a greater transverse breadth in proportion to its length, the Afghan one showing a greater length in proportion to its breadth. All my specimens of the Indian variety are produced or elongated posteriorly, giving the shell a narrow wedge-shaped appearance, whereas the Afghan one, being transversely shorter, appears ovate-oblong."

*Var. cylindrica* (*Hanley & Theobald*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 855.

*Unio marginalis* var. *cylindrica*, H. & T., C. I. 1876, p. 20, pl. 44, fig. 1.

As hitherto the name has been a mere *nomen nudum*, and no specimen actually corresponding to Hanley & Theobald's figure being available the following short description of the figure itself may be given:—

Rather more rectangular than the typical form, dark olive-green, concentrically banded, especially towards the ventral margin and posterior side, with yellowish brown, and transversely rayed from the umbonal region with dark olive-brown; interior of shell salmon-coloured.

Long. 44, lat. 10.2 mm.

*Hab.* —?

*Var. hanleyi*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 855.

*Unio marginalis* var. *corriana*, H. & T., C. I. 1876, p. 20, pl. 44, fig. 4.

Shell more or less indented in the middle, sometimes elongated cylindrical, sometimes compressed and oval-oblong; cardinal callosity (which is rarely absent) more or less developed; anterior or hinge teeth almost horizontal, outwardly curved, rather more elongate, or if shorter, rather more prominently elevated.

Long. 42, lat. 89 mm. (fig. in Con. Ind.).

*Hab.* Calcutta, etc.

### Subsp. *thwaitesi* (Lea).

*Unio thwaitesi*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iii, 1859, p. 152; Journ. Acad. Nat. Sci. Philadelphia, iv, 1860, p. 246, pl. 37, fig. 125; Obs. Genus *Unio*, vii, 1860, p. 64, pl. 37, fig. 125; Reeve, Conch. Icon. xvi, 1865, pl. 23, fig. 105; H. & T., C. I. 1876, p. 20, pl. 43, fig. 1; Pætel, Conch. Sam. iii, 1890, p. 169.

*Margaron (Unio) thwaitesii*, Lea, Syn. 1870, p. 74.

*Unio consobrinus*, H. & T., C. I. 1876, p. 19, pl. 41, fig. 7.

*Lamellidens thwaitesii* (Lea), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 856.

*Original description*:—Testa lævi, regulariter elliptica, sub-inflata, inæquilaterali; valvulis crassiusculis; natibus prominulis; epidermide castanea, polita, transverse fasciata; dentibus cardinalibus valde compressis, lamellatis, valde obliquis, in utroque valvulo duplicibus; lateralibus longis, lamellatis curvisque; margarita salmonis colore tincta et iridescente.

*Hab.* Ceylon (*Thwaites*).

The following dimensions are taken from three specimens in the Indian Museum :—

	1.	2.	3.
Long. ....	44·5	35	34 mm.
Lat. ....	88	63	62 mm.
Diam. ....	28·25	20	20·25 mm.

**Subsp. consobrina (Lea).**

*Unio consobrinus*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iii, 1859, p. 331; Journ. Acad. Nat. Sci. Philadelphia, 1860, p. 272, pl. 45, fig. 152; Obs. Genus *Unio*, vii, 1860, p. 90, pl. 45, fig. 152; Pætel, Conch. Sam. iii, 1890, p. 148.

*Margaron (Unio) consobrinus*, Lea, Syn. 1870, p. 46.

*Unio corbeti*, Deschamps, Bull. Soc. Zool. Fr. xvii, 1892, p. 68, fig. in text.

*Lamellidens consobrinus* (Lea), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 856.

*Original description* :—Testa lævi, elliptica, subinflata, inæqui-laterali, postice obtuse angulata, antice rotundato; valvulis subtenuibus, antice paulisper crassiusculis; natibus prominulis; epidermide micante, tenebroso-fusca, eradiata; dentibus cardinalibus parvis, crenulatis, compressis, obliquis in valvulam dextram duplicibus; lateralibus longis, lamellatis subcurvisque; margarita salmonis colore tincta et valde iridescente.

*Hab.* "China" (*C. M. Wheatley*).

The locality as given by Lea is probably a mistake; the variety is widely distributed over India and Ceylon.

The following are the dimensions of three specimens in the Indian Museum collection :—

	1.	2.	3.
Long. . . . .	43	48·5	47 mm.
Lat. . . . .	79	91	83 mm.
Diam. . . . .	27·5	32	27 mm.

**Subsp. lamellata (Lea).**

*Unio lamellatus*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. vi, 1838, p. 19, pl. 6, fig. 16; Obs. Genus *Unio*, ii, 1838, p. 19, pl. 6, fig. 16; Troschel, Arch. Natg. Berlin, v, pt. 2, 1839, p. 234; Hanley, Test. Moll. 1842, p. 194; Biv. Shells, 1843, p. 194, pl. 21, fig. 49; Catlow & Reeve, Conch. Nom. 1845, p. 60; H. & A. Adams. Gen. Rec. Moll. ii, 1857, p. 494; Chenu, Ill. Conch. 1858, pl. 22, figs. 3, 3 a, 3 b; Sowerby, Conch. Icon. xvi, 1866, pl. 52, fig. 272; H. & T., O. I. 1876, p. 21, pl. 44, fig. 7; Pætel, Conch. Sam. iii, 1890, p. 126.

*Margarita (Unio) lamellatus*, Lea, Syn. 1836, p. 26; 1838, p. 20.

*Margeron (Unio) lamellatus*, Lea, Syn. 1852, p. 29; 1870, p. 46.

*Unio layardi*, Lea, Proc. Acad. Nat. Sci. Philadelphia, iii, 1859, p. 153; Journ. Acad. Nat. Sci. Philadelphia, iv, 1860, p. 243, pl. 36, fig. 122; Obs. Genus *Unio*, vii, 1860, p. 61, pl. 36, fig. 122;

Reeve, Conch. Icon. xvi, 1865, pl. 23, fig. 111; H. & T., C. I. 1876, p. 19, pl. 41, fig. 1; Pæstel, Conch. Sam. iii, 1890, p. 157.

*Margaron (Unio) layardii*, Lea, 1870, p. 46.

*Lamellidens lamellatus* (Lea), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 856.

*Original description*:—Shell subovate, transverse, somewhat inflated, shining; valves very thin; beaks scarcely prominent, undulated; cardinal teeth long, thin and lamellar; lateral teeth long, thin, and nearly straight; nacre bluish.

Long. 38, lat. 64, diam. 25.5 mm.

*Hab.* Bengal (*Captain Lang*). This variety is represented by specimens in the Indian Museum bearing the following localities:—Mandalay, Pegu, Bhamo (*Dr. J. Anderson*), also Calcutta and Ceylon.

Var. *sublamellata*, *Preston*, Rec. Ind. Mus., Calcutta, vii, 1912, p. 305.

*Original description*:—An elongate, somewhat rostrate form, having the hinge-teeth rather less developed.

*Hab.* Burma (*W. Theobald*).

The type is in the Indian Museum.

#### Subsp. *scutum* (*Sowerby*).

*Unio scutum*, *Sowerby*, Conch. Icon. xvi, 1868, pl. 94, fig. 510; H. & T., C. I. 1876, p. 22, pl. 46, fig. 1; Pæstel, Conch. Sam. iii, 1890, p. 167.

*Lamellidens scutum* (*Sowerby*), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 857.

*Original description*:—Shell thick, unequally subventricose, somewhat indented in the middle, somewhat depressed in front, very inequilateral, oblong, obliquely sub-triangular behind, of a uniform pitch-colour, smoothish; ventral edge retuse, rising in front; umbonal ridge elevated, the space behind it broad and rather concave; beaks but little projecting, nacre livid whitish; primary teeth slanting, lateral lamellæ distant.

The dimensions of the specimen figured in the 'Conch. Icon.', and now in the British Museum, are as follows:—

Long. 50, lat. 100, diam. 32.5 mm.;

and those of a specimen in the Indian Museum collection:—

Long. 52.25, lat. 98, diam. 35.25 mm.

*Hab.* Tenasserim (original locality); there are also specimens labelled "Rangoon" in the Indian Museum.

Var. *humilior* (*von Martens*), Arch. Naturg. Berlin, lxx, pt. 1, 1899, pp. 45, 46, pl. 5, fig. 1.

Somewhat more depressed than the typical form, but agreeing



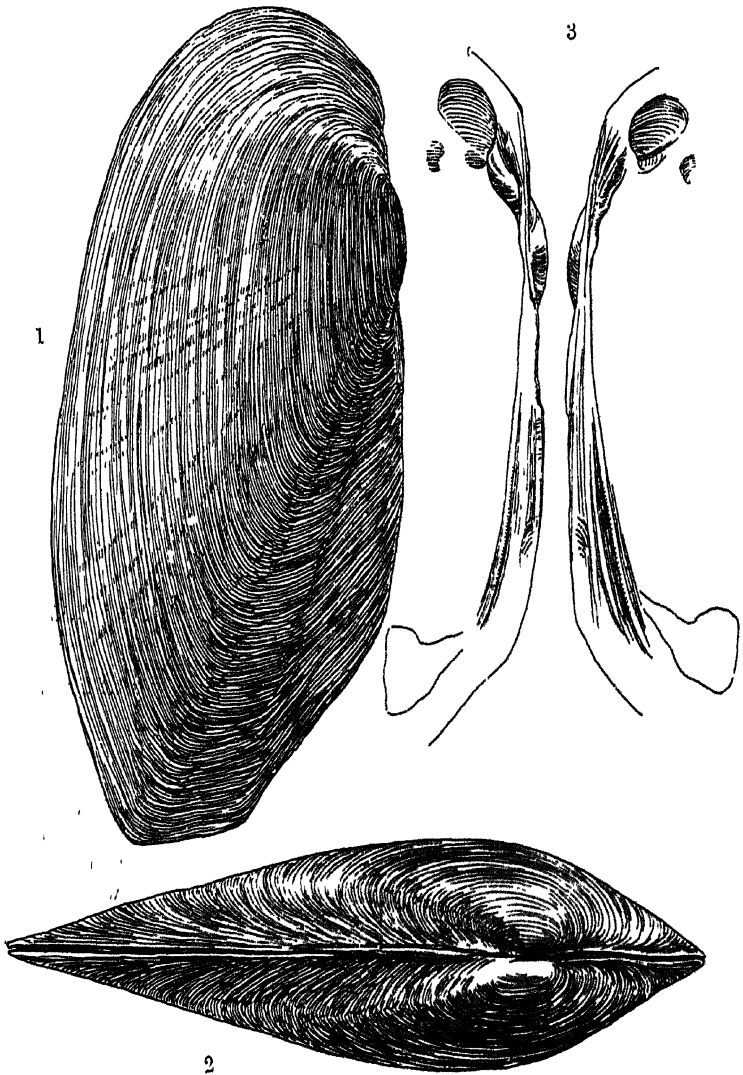


Fig. 19.—1 & 2. *Lamellidens* (*L.*) *marginalis*, Lk. var. *sublamellata*, Preston.  
(Type.) Nat. size.

3. Hinge and muscular scars of same.

well in other respects; juvenile specimens are bright brownish-green, older ones blackish; the following are the measurements of a series at various stages of growth:—

	1.	2.	3.	4.	5.	6.
Lat. ....	124	92	79	72	65	43 mm.
Long. (from umbones) ..	49	40	36	32	28	19 mm.
Long. (from posterior extremity of wing) ....	56	46	39	37	32	21 mm.
Diam. ....	26	25	20	20	17	11 mm.

The wings average two-thirds of the length. The lower margin in young specimens is fairly straight in the middle, in older ones slightly curved inward. The edge running backwards from the umbones, separating the posterior from the lateral surface, is always distinct. The hinge-teeth are nodulated, but comparatively small.

*Hab.* The Chindwin River, near Kalewa; also in the River Yu, one of the tributaries of the former.

Young specimens of this variety, in outward form, greatly resemble the *U. marginalis* var. *anodontinus* of the 'Conch. Ind.', pl. 42, fig. 7.

#### Subsp. *corrianus* (Lea).

*Unio corrianus*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. v, ser. 2, 1834, p. 65, pl. 9, fig. 25; Obs. Genus *Unio*, i, 1834, p. 177, pl. 9, fig. 25; Hanley, Test. Moll. 1842, p. 207; Biv. Shells, 1843, p. 207, pl. xx, fig. 60; Catlow & Reeve, Conch. Nom. 1845, p. 57; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 491; Pæstel, Conch. Sam. iii, 1890, p. 149.

*Margarita (Unio) corrianus*, Lea, Syn. 1836, p. 38; 1838, p. 25.

*Margaron (Unio) corrianus*, Lea, Syn. 1852, p. 38; 1870, p. 61.

*Lamellidens corrianus* (Lea), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 857.

*Original description*:—Shell narrow-elliptical, very transverse, very inequilateral, subangular behind; valves very thin; beaks scarcely prominent; cardinal teeth thin and bladed; lateral teeth long, thin and nearly straight; nacre pearly white and iridescent.

Long. 25·5, lat. 53·5, diam. 13·5 mm.

*Hab.* Calcutta. The following localities refer to specimens in the Indian Museum:—Sebsaugor (*Peal*); Pegu (*W. T. Blanchford*); Balagunga, Central Sylhet; Madras; Berhampur, Murshidabad District, Bengal (*S. W. Kemp*); Sambalpur; Zayleyman, Upper Burma (*Dr. J. Anderson*).

Lea's description is amplified by the following notes:—"Shell narrow elliptical, very transverse, very inequilateral, subangular behind; dorsal line nearly straight; substance of the shell very thin; beaks very slightly elevated and minutely waved at the tip; ligament long and slender; epidermis smooth, dark brown; rays none; cardinal teeth thin, bladed, single in the *left* valve and

double in the *right*; lateral teeth long, thin, bladed and nearly straight; anterior cicatrices distinct; posterior cicatrices confluent; dorsal cicatrices situated nearly in the centre of the cavity of the beaks; cavity of the beaks exceedingly shallow; nacre pearly white and iridescent. . . . . It closely resembles the *U. marginalis* of Lamarck, but differs from that species in being more transverse, in the beaks being more retuse, in the dorsal line being nearly straight, and in its not being possessed of a light border along the margin. The cardinal teeth are remarkably thin, and form nearly a line with the lateral teeth."

**Subsp. *generosus* (Gould).**

*Unio generosus*, Gould, Proc. Boston Soc. Nat. Hist. ii, 1847, p. 220; Otia Conch. 1862, p. 210; H. & T., C. I. 1876, p. 22, pl. 46, fig. 4; Pætel, Conch. Sam. iii, 1890, p. 153.

*Margaron (Unio) generosus*, Lea, Syn. 1870, p. 29.

? *Unio lamellatus*, Sowerby, Conch. Icon. xvi, 1868, pl. 94, fig. 511.

*Lamellidens generosus* (Gould), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 857.

*Original description*:—Testa magna, solida, transversa, oblongo-ovata, inequilaterali, antice rotundata et angustata; postice obliquata, subrostrata, ad apicem truncata; margine ventrali arcuata, dorsali recta, abscedente; umbonibus contiguis haud elevatis; valvis subtumidis radiatim substriatis, postice subcostatis, epidermide fuliginosa, disco nitido: dentibus remotis; cardinalibus elongatis, obliquis, laminatis: margarita alba vel salmonacea limbo iridescente.

Long. 64, lat. 95.5, diam. 38.25 mm.

*Hab.* Newville, Tavoy (*Mrs. Vinton*); specimens in the Indian Museum are labelled respectively Myadong, Upper Burma (*Anderson*), Mandalay (*Annandale*), and Bhamo (*J. Coggin Brown*).

**Subsp. *jenkinsianus* (Benson).**

*Unio jenkinsianus*, Benson, A. M. N. II. x, 1862, p. 185; H. & T., C. I. 1876, p. 19, pl. 41, fig. 4; Pætel, Conch. Sam. iii, 1890, p. 155.

*Lamellidens jenkinsianus* (Benson), Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 857.

*Original description*:—Testa transverse elongata, subacuminato-ovata, valde inæquilaterali, tumida, crassa, antice brevi rotundata, postice elongata, minime alata, superne sensim descendente, demum angusta, obtusa; margine basali antice convexiusculo, postice subrecto; ligamento brevi; disco valde tumido, transverse plicato; epidermide picea, versus marginem ventralem olivacea; umbonibus leviter convexis, decorticatis, apicibus obtusis; dentibus arcuatim sitis, crassiusculis, erosio, cardinalibus elongatiusculis,

valvæ sinistrae subsimplicibus, dextrae duplicibus laminatis, laterali-bus remotis subelongatis, valvæ sinistrae duplicibus, lamina interna demum incrassata; margarita violaceo-albida, iridescente.

Long. 52, lat. 94, diam. 38 mm.

*Hab.* Brahmapootra River, Assam. The following localities are, among others, attached to specimens in the Indian Museum:—Sylhet, Bhagalpur (*Captain Sherwill*).

Subsp. *sawaddyensis*, *Preston*, Rec. Ind. Mus., Calcutta, vii, 1912, p. 305.

*Original description*:—Shell much more ovate and convex than the typical form, having the dorsal margin more arched and posteriorly ascending, the ventral margin and anterior side more rounded, and the posterior side produced and roundly rostrate.

*Hab.* Sawaddy River. Specimens in the Indian Museum are labelled Bhamo (*Dr. J. Anderson*); Shuaygoomyo, Upper Burma (*Dr. J. Anderson*), and Mandalay (*Dr. N. Annandale*).

The type is in the Indian Museum.

### 311. *Lamellidens pulcher* (*Tapparone-Canefri*).

*Lamellidens pulcher* (*Tapparone-Canefri*); *Simpson*, Washington, D.C., *Smiths. Inst., Nat. Mus. Proc.* xxii, 1900, p. 856.

*Unio pulcher*, *Tapparone-Canefri*, *Ann. Mus. Civ. St. Nat. Genova*, vii, 1889, p. 350.

*Original description*:—Testa tenui, subcompressa, inæquilaterali, transverse ovata, subquadrata, postice dilatata, sub-biangulata, area postica depressa, margine ventrali rectiusculo, umbonibus haud eminentibus, rarius integris, sæpius breviter decorticatis. Superficies valvarum lævis, nitida, rugis concentricis minutis, subregularibus, sæpe obsoletis exarata; pallide olivaceo-castanea, radiis duobus inæqualibus in area postica fuscis vel viridibus picta. Dentes cardinales parvi, laminati, infero in valva dextera crassiusculo, subtruncato, superne acuto. Margarita argentea, superne luteo-carnea vel luteola.

Long. 43, lat. 70, diam. 22 mm.

*Hab.* Meetan, River Houngdaran (*L. Fea*).

The author also describes two varieties of this species as follows:—

#### Var. *lamellatiformis*.

Testa magis postice dilatata, inferne bisinuata.

Long. 43, lat. 76, diam. 21 mm.

#### Var. *ponderosus*.

Testa majore, crassiuscula, magis lata, subquadrato-oblonga, superficies valvarum castanea vel castaneo-fusca.

Long. 48, lat. 84, diam. 28 mm.

Both the varieties are from the same locality as the type.

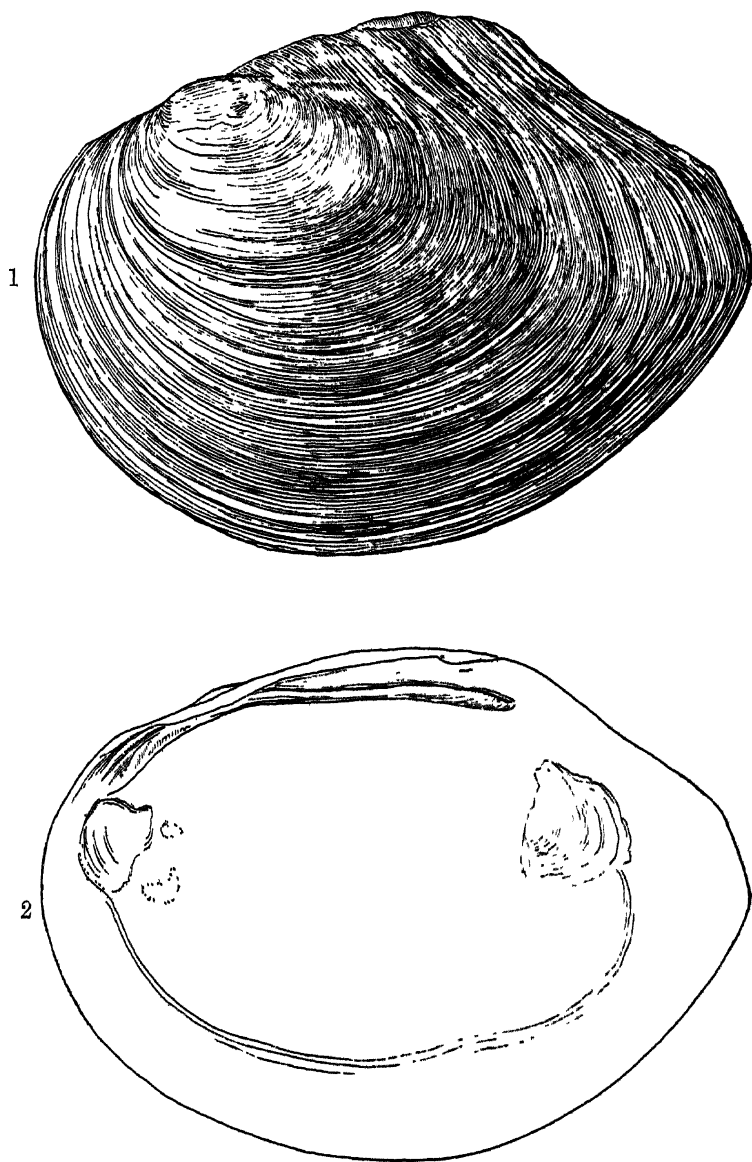


Fig. 20.—1. *Lamellidens (L.) marginalis* (Lk.), var. *sawaddyensis*.  
(Type specimen.) Nat. size.

2 Muscular scars and pallial impression of same.

312. *Lamellidens exanthematicus* (Küster).

*Lamellidens exanthematicus* (Küster); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 856.

*Unio exanthematicus*, Küster, Conch. Cab., *Unio*, 1861, p. 243, pl. 81, fig. 2; Pætel, Conch. Sam. iii, 1890, p. 152.

*Original description*:—Testa transversa, subovata, convexa, tenuis flava, fusciscenti-annulata, postice viridi-radiata, subtiliter striata, subtilissime pustulata, pustulis numerosis, majoribus minoribusque mixtis; umbonibus prominulis; area subtrigona, compressiuscula; dentibus cardinalibus parvis, minus elevatis, in valvula utraque duplicibus, lamellis longis, curvatusculis; margarita carneo-alba et iridescente.

Long. 26, lat. 43, diam. 13.5 mm.

*Hab.* East Indies.

313. *Lamellidens canefrianus*, Simpson.

*Lamellidens canefrianus*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 857.

*Unio protensus*, Tapparone-Canefri, Ann. Mus. Civ. St. Nat. Genova, vii, 1889, p. 349.

*Original description*:—Testa transverse oblonga, inæquilaterali, postice subbiangulata, inter angulos truncata et in rostrum abbreviatum attenuata, margine ventrali modice arcuato et ad rostrum sinuato, umbonibus late decorticatis. Superfices valvarum epidermide lævi, intense fusca in adultis, viridi-olivacea in junioribus induta, zona marginali pallidiore inferne ornata. Dentes cardinales tenues, in valva dextera duo majusculi, laciniato-striati, margine denticulati, in valva sinistra unicus, tenuior, ultra medium subacutus. Margarita argentea, postice vivide iridescens; superficies interna valvarum sæpius plus minusve margaritifera.

	1.	2.
Long. ....	89	65 mm.
Lat. ....	44	34 mm.
Diam. ....	27	18 mm.

*Hab.* Prome, Lower Burma (*L. Fea*).

314. *Lamellidens narainporensis*, Preston.

*Lamellidens narainporensis*, Preston, Rec. Ind. Mus., Calcutta, vii 1912, pp. 305-306.

*Original description*:—Shell cuneate, moderately convex, posteriorly rostrate, dark reddish-brown, covered towards the margins with a finely laminiferous periostracum, marked with concentric lines of growth, bearing two carinæ on each valve running from the umbones in a dorsally posterior direction; umbones small, not prominent, somewhat coarsely corrugated; dorsal margin

very gently arched; ventral margin scarcely rounded in the anterior and median regions, slightly curved posteriorly; anterior side abruptly rounded; posterior side sloping above, then angled and very abruptly descending; cardinal tooth in left valve obtusely triangular, erect; absent in right valve; lateral teeth anteriorly short, deeply grooved and projecting in right valve, erect and jagged in the left, posteriorly moderately elongate and

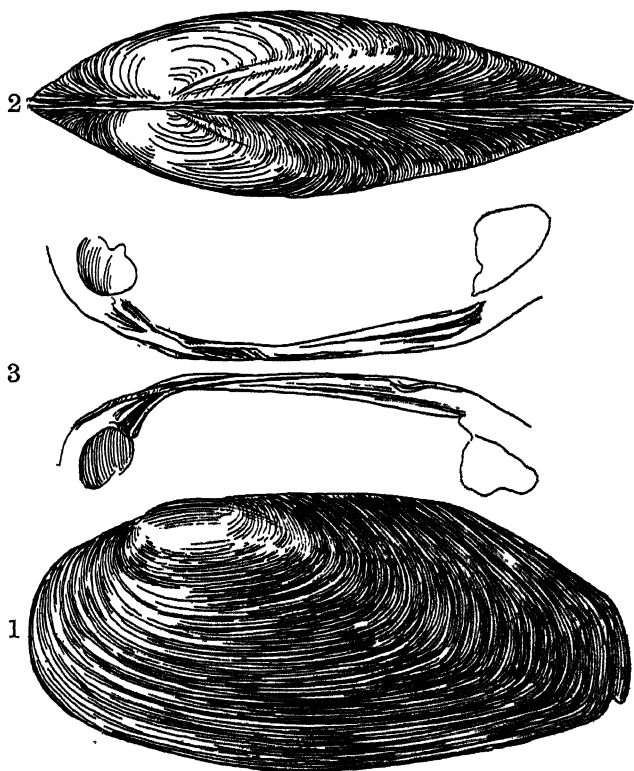


Fig. 21.—1 & 2. *Lamellidens (L.) narainporensis*, Preston. (Type.) Nat. size.  
3. Hinge and muscular scars of same.

bifurcated in both valves; anterior scars rather circular, deep; posterior scars lightly impressed; interior of shell pale flesh-colour, shading to iridescent bluish-white, very minutely granulate.

Long. 35, lat. 84 mm.

*Hab.* Narainpore Bhil, Murshedabad District (Major C. J. Robertson-Milne, I.M.S.).

The type specimen is in the Indian Museum.

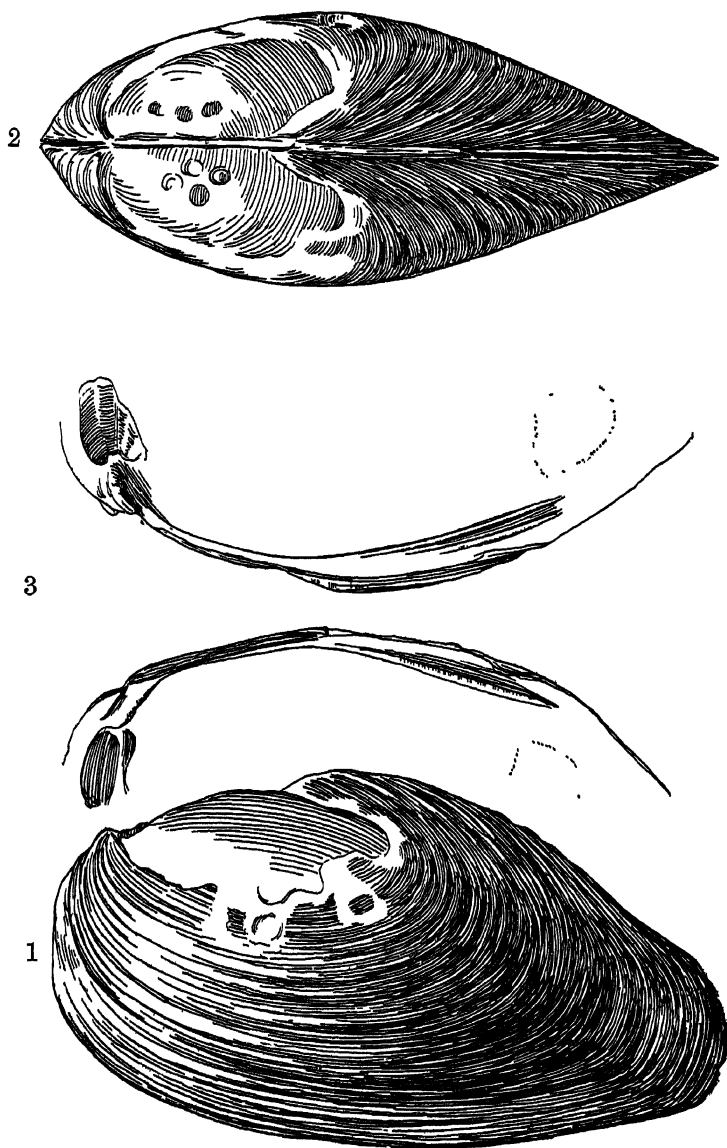


Fig. 22.—1 & 2. *Lamellidens (L.) nongyangensis*, Preston. (Type.) Nat. size.  
3. Hinge and muscular scars of same



315. *Lamellidens nongyangensis*, Preston.

*Lamellidens nongyanensis*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 306.

*Original description*:—Shell very elongately ovate, inflated, covered with a blackish-brown, finely laminiferous periostracum, concentrically marked with rather coarse lines of growth; dorsal margin anteriorly somewhat straight, posteriorly arched above, sloping and slightly excavated below; ventral margin scarcely rounded; anterior side abruptly descending; posterior side rostrate, obtusely rounded; cardinal teeth very anteriorly situate, triangular, erect; lateral teeth elongate, also erect, terminating posteriorly in an abrupt slope; anterior scars deeply marked, posterior scars lightly impressed; interior of shell flesh-coloured, shading to bluish; iridescent, minutely pitted and granulate.

Long. 45, lat. 94 mm.

*Hab.* Nongyang Lake, South of Patkai.

The type is in the Indian Museum.

316. *Lamellidens phenchooganjensis*, Preston.

*Lamellidens phenchooganjensis*, Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 306.

*Original description*:—Shell very elongately ovate, posteriorly obtusely rostrate, dark blackish-brown, sculptured with fine concentric striæ, crossed, especially in the anterior median region, by fine, slightly distant, transverse, radiate striæ, thus presenting a minutely wrinkled appearance; umbones flattened, much eroded; dorsal margin anteriorly gently sloping, posteriorly more rapidly sloping in a slight curve; ventral margin scarcely rounded; anterior side angled above, gently rounded below; posterior side produced, angularly rounded; hinge-teeth very elongate, somewhat fine; anterior scars ovate, moderately impressed; posterior scars roughly triangular, not well impressed; interior of shell shading from pale brown to bluish, nacreous, marked, especially towards the anterior ventral region, with very shallow radiate furrows.

Long. 42, lat. 86 mm.

*Hab.* Phenchooganj, Central Sylhet.

The type specimen is in the Indian Museum.

317. *Lamellidens mainwaringi* (Nevill, MS.), (Preston.)

*Lamellidens mainwaringi* (Nevill, MS.), Preston, Rec. Ind. Mus. Calcutta, vii, 1912, p. 306.

*Original description*:—Shell rather small, cuneate, covered with a finely laminiferous periostracum; both valves marked with rather fine, concentric, and finer transverse, radiate, scratch-like

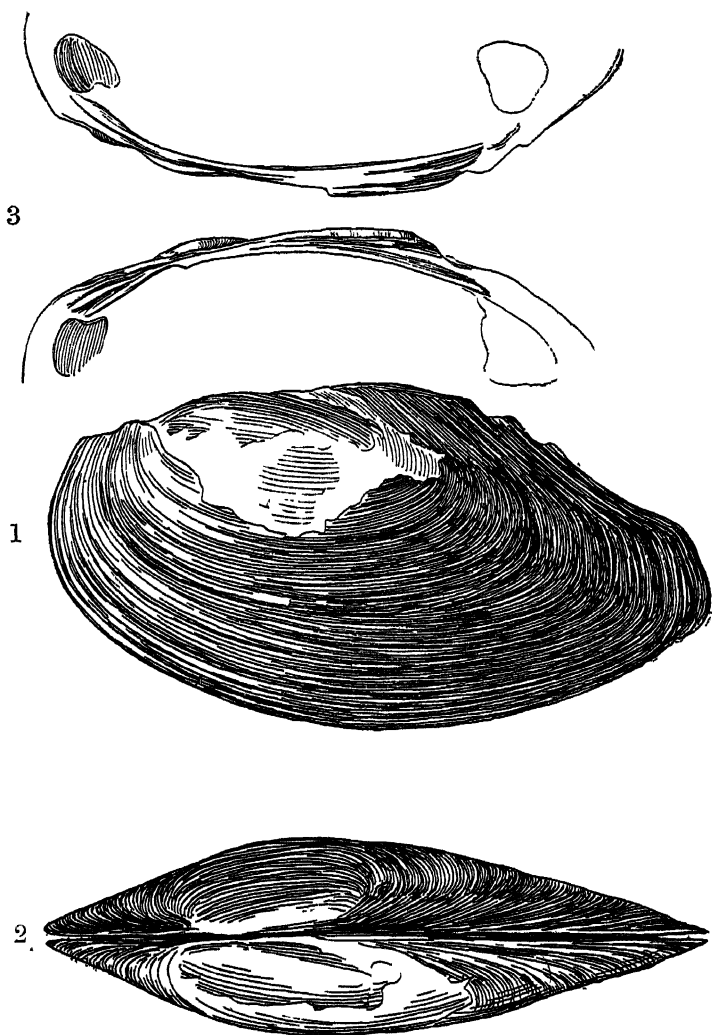


Fig. 23.—1 & 2. *Lamellidens (L.) phenchooganjensis*, Preston  
(Type) Nat. size.

3. Hinge and muscular scars of same.

striæ; dorsal margin anteriorly gradually sloping, posteriorly arched and more rapidly descending; ventral margin somewhat straight; anterior side rounded; posterior side angled above and below, somewhat obliquely and obtusely rostrate; hinge teeth



Fig. 24.—1 & 2. *Lamellidens (L.) mainwaringi*, Preston. (Type.) Nat. size.  
3. Hinge of same.

well developed, moderately short; anterior adductor scar deeply impressed; posterior scar somewhat roughly triangular, well impressed; interior of shell bluish iridescent, rather granulate.

Long. 25·5, lat. 50 mm.

*Hab.* Siliguri; there are also specimens in the Indian Museum from Namtsik, Dihong River.

Type in the Indian Museum.

A small, light, and thin form, which Simpson in his 'Synopsis of the Naiades' \* refuses to recognise as a species, but regards as *L. consobrinus*; the author, however, having been able to examine a large series from the collection of the Indian Museum, all the specimens of which are very constant in their size, form, and hinge, and other characters, considers it without doubt to be worthy of specific rank.

The following dimensions are taken from specimens in the Indian Museum Collection:—

	1.	2.	3.
Long. ....	22·25	21	29·5 mm.
Lat. ....	41·75	40·5	37 mm.
Diam. ....	11·75	12·5	9·25 mm.

\* Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 856 (footnote no. 3).

Genus **TRAPEZOIDEUS.**

*Trapezoideus*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, p. 858.

TYPE, *Unio foliacea*, Gould; Burma.

Range. Burma; Siam; Cambodia; Sumatra; Bundelkund.

*Original description*:—Shell trapezoid, much compressed, with a low posterior ridge and but slightly raised though pointed beaks, which seem to be sculptured with irregularly radial ridges arranged in two imperfect chevron-shaped loops; surface concentrically sculptured, often having irregular radial ridges on the posterior slope; epidermis yellowish-green or brownish, with two or more green rays above the posterior ridge; teeth compressed; two pseudocardinals in the left valve, one under the beak, the other in front, often not well separated, and two laterals; right valve with two pseudocardinals and one lateral; pseudocardinals all irregular, often pitted and peculiarly dentellate; laterals granular, showing traces of vertical striation; cavity of the beaks rather deep, compressed; muscle scars shallow, anterior scars separate; nacre soft, creamy, yellowish in the beak cavities.

Animal unknown.

318. *Trapezoideus foliaceus* (Gould).

*Trapezoideus foliaceus* (Gould); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 858.

*Unio foliaceus*, Gould, Proc. Boston Soc. Nat. Hist. i, 1843, p. 141; Otia Conch. 1862, p. 191.

*Unio foliaceus*, Catlow & Reeve, Conch. Nom. 1845, p. 59; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 492; H. & T., C. I. 1876, p. 19, pl. 42, fig. 3; Anderson, Yunnan Exp. 1877, p. 900, pl. 80, figs. 8-12; Pætel, Conch. Sam. iii, 1890, p. 153.

*Margaron (Unio) foliaceus*, Lea, Syn. 1852, p. 39; 1870, p. 62.

*Unio peguensis*, Anthony, Amer. Journ. Conch. i, 1865, p. 351, pl. 25, fig. 2; Sowerby, Conch. Icon. xvi, 1868, pl. 95, fig. 519; Pætel, Conch. Sam. iii, 1890, p. 162.

*Margaron (Unio) peguensis*, Lea, Syn. 1870, p. 51.

*Original description*:—Testa parva, compressa, fragili, fusco-virescente, inequilateralis, transverse oblongo-ovata, postice subangulata; umbonibus parvis, subtilissime corrugatis; dentibus exilibus, rectis, ad marginem parallelis; margarita livida, iridescente.

Long. 22, lat. 41.5, diam. 12.75 mm.

*Hab.* Tavoy. Represented in the Indian Museum by specimens from Bhamo (*Dr. J. Anderson*), and Pegu (*W. T. Blanford*).

Var. *comptus* (*Deshayes & Jullien*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 859.

*Unio comptus*, Deshayes & Jullien, Nouv. Arch. Mus. Paris, x, 1874, p. 126, pl. 6, figs. 3 & 4.

*Unio fragilis*, Nevill, J. A. S. B. xlv, 1877, p. 39; Anderson, Yunnan Exp. 1877, p. 400, pl. 80, figs. 8-12.

*Original description*:—'Testa oblonga, transversa, compressa, tenui, fragili, inæquilaterali, luteo-rubiginosa, ad apicem decorticata et striis granulosis divaricatis ornata; umbonibus minimis, obtusis, vix prominentibus; latere antico obtuso, paulo angustiori; latere postico latiori, oblique truncato, striis numerosis, subæqualibus, arcuatis, ab angulo postico nascentibus ornato; margine cardinali brevi, angusto, in valvula dextra dente cardinali minimo, obliquo, simplici, vix proeminenti, dente laterali postico elongato, angustissimo; in altera valvula dentibus cardinalibus duobus, inæqualissimus, divaricatis, dente postico angusto profunde et angustissime bifido.

Long. 18, lat. 32, diam. 10 mm.

*Hab.* Cambodia.

Var. *zayleymanensis* (Nevill, MS.); Preston, Rec. Ind. Mus., Calcutta, vii, 1912, p. 307.

*Original description*:—Shell thinner and smaller than the typical form, more produced anteriorly and much more obtuse posteriorly; the slight curve in the ventral margin is also absent.

*Hab.* Bhamo (Dr. J. Anderson); there are also specimens in the Indian Museum from Zayleyman (Anderson) and Bhamo.

Type in the Indian Museum.

### 319. *Trapezoideus misellus* (Morelet).

*Trapezoideus misellus* (Morelet); Simpson, Washington, D.C., - Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 859.

*Unio misellus*, Morelet, Journ. de Conch., Paris, xiii, 1865, p. 21; Ser. Conch. iv, 1875, p. 341, pl. 14, fig. 2; Prætel, Conch. Sum. iii, 1890, p. 159.

*Unio siamensis*, Lea, Proc. Acad. Nat. Sci. Philadelphia, x, 1866, p. 133; Journ. Acad. Nat. Sci. Philadelphia, vi, 1868, p. 279, pl. 38, fig. 93; Obs. Genus *Unio*, xii, 1889, p. 30, pl. 38, fig. 93.

*Margaron* (*Unio*) *siamensis*, Lea, Syn. 1870, p. 57.

*Original description*:—Testa transversa, depressa, inæquilateralis, tenuis, epidermide lamelloso-striata, luteo-virenti, progressu temporis fusciscente, vestita; margo anterior attenuatus, posterior dilatatus, inferior medio sinuatus; umbones parvi, depressi, acuti, plerumque decorticati; dens cardinalis lamelliformis, exilissimus, in adultis obsoletus; lamellæ in utraque valva parvulæ, simplices; testa interna inæqualiter sulcata vel malleata; margarita plumbea, squalida, sub umbonibus late rubigineo tineta.

Long. 28, lat. 61, diam. 16 mm.

*Hab.* Siam. Represented in the Indian Museum by specimens from Tenasserim, and the Irrawaddy River at Sagaing (*J. Coggin Brown*).

320. *Trapezoideus exolescens* (Gould).

*Trapezoideus exolescens* (Gould); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 859.

*Unio exolescens*, Gould, Proc. Boston, Soc. Nat. Hist. i, 1843, p. 141; Catlow & Reeve, Conch. Nom. 1845, p. 59; H. & A. Adams, Gen. Rec. Moll. ii, 1857, p. 493; H. & T., C. I. 1876, p. 43, pl. 107, fig. 5; Pætel, Conch. Sam. iii, 1890, p. 152.

*Margaron (Unio) exolescens*, Lea, Syn. 1852, p. 32; 1870, p. 51.

*Original description*:—Testa transverso-oblongata, inequilateriali, subcompressa, fusco-virescente; postice dilatata, sub-biangulata; umbonibus subelevatis; dentibus cardinalibus parvis, obliquis, interdum exoletis; lateralibus remotis, rectis; margarita livida vel ferruginea.

Long. 32, lat. 70, diam. 15 mm.

*Hab.* Tavoy; also Bhamo (Indian Museum Collection).

321. *Trapezoideus theca* (Benson).

*Trapezoideus theca* (Benson); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 859.

*Unio theca*, Benson, A. M. N. H. x, 1862, p. 186; H. & T., C. I. 1876, p. 6, pl. 12, fig. 5; Pætel, Conch. Sam. iii, 1890, p. 169.

*Original description*:—Testa transverse oblongo-ovata, valde inæquilateriali, tenui, compressa, antice et postice rotundata, superne subtusque convexiuscula, margine ventrali medio recto; disco subplanato, læviusculo, lineis transversalibus subrugosis versus margines notato; epidermide pallide stramineo-lutea; umbonibus planatis, decorticatis, versus apices tenues prominulos, concentrice sulcatis, postice lineis duabus radiantibus tenuibus subelevatis munitis; ligamento longiore; dentibus cardinalibus laminatis, tenuibus, brevibus, utriusque valvæ duplicibus, valvæ dextræ prope marginem anteriorem sitis, obliquis; sinistræ lobo subapicali transverso, anteriore obliquo, lateralibus elongatis, vix curvatis, valvæ dextræ simplicibus, sinistræ duplicibus; margarita lutea, versus marginem ventralem albida.

Long. 20, lat. 40, diam. 10 mm.

*Hab.* River Cane, near Banda, Bundelkhund.

The above description is amplified by the following notes:—  
“Interior of shell transversely subpubescent; cavity of beaks shallow. Anterior cicatrices separate, posterior confluent, apical ones in the cavity of the beaks. Some slight rugæ are visible on the posterior slope at right angles to the striæ of growth.

“..... The shell is somewhat wider posteriorly than anteriorly. The pale opaque straw-colour of the unpolished epidermis is also a peculiar feature, not observable in any other Northern Indian species.

..... the double umbonal line, apparent occasionally in adult specimens of *U. [(L.) L.] marginalis*, is conspicuous.”

Genus **ARCIDOPSIS.**

*Arcidopsis*, Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 861.

TYPE, *Unio footei*, Theobald, from the Kistna River.

The genus is represented by a single species (*A. footei* (*Theobald*)).

*Original description*:—Shell inequilateral, elongated, with dorsal and ventral lines nearly straight and parallel; anterior end strongly and obliquely truncated from the beaks to the anterior base, and ending in a rather sharp but rounded point below; posterior end obliquely truncated above, rounded below; posterior ridge full, rounded; the shell in front and below rather compressed; surface concentrically and radially ridged; pseudocardinals strong, two in the right valve, one in the left, and supported by a strong cardinal rib; muscle scars well impressed; pallial line distinct.

Animal unknown.

322. *Arcidopsis footei* (*Theobald*).

- *Arcidopsis footei* (*Theobald*); Simpson, Washington, D.C., Smiths. Inst., Nat. Mus. Proc. xxii, 1900, p. 861.

*Unio footei*, Theobald, J. A. S. B. xlv, 1876, p. 187, pl. 14, figs. 9, 9 a.

*Original description*:—Testa elongata, rotundato-quadrata, valde inæquilaterali ab umbonibus angulata, et infra et antice valde compressa, concentrice striata et postice radiatim striata. Dentibus cardinalibus fortibus, in callo costiformi positus, in valva dextra duobus alteraque singulis, subverticalibus. Cicatricibus valde depressis. Pallii impressione valde conspicua.

*Hab.* Kistna River near the "Gutparba falls" (*A. B. Foote*).

To Theobald's description is added the further note. "The shell has its valves divided into two subequal areas by a strong ridge running back and down from the beaks. The lower and anterior portion is strongly compressed, simulating the appearance of *Arca sub torta*, though there is no true "version" in the valves. The strong cardinal rib which supports the cardinal teeth is also a marked feature of this species, as well as its radiating striæ intersecting the concentric lines of growth. Unfortunately the beaks are much decayed in my two specimens and their sculpture wholly effaced."

## Family ÆTHERIIDÆ.

## Subfamily ÆTHERIINÆ.

Shell irregular, free or attached, covered with a periostracum, interiorly nacreous or subnacreous; hinge edentulate; ligament linear, subinternal; sometimes with two adductor scars on the valves, sometimes with only the posterior; pallial line entire.

Animal fluviatile; mantle open; branchial orifice communicating with the pedal orifice; anal orifice closed; foot absent; palpes large, semi-ovate; gills unequal, folded, uniting behind together with the visceral sac and the mantle.

*Distribution.* Tropical Africa; S. India; United States of Colombia.

## Genus MULLERIA.

*Mulleria*, Férussac, Mém. Soc. Hist. Nat. Paris, 1824, i, part 2, pp. 368-369; Sowerby, Conch. Icon. xvii, 1872.

TYPE, *Mulleria lobata*, Férussac, from the U.S. of Colombia.

Range. United States of Colombia and Southern India.

Translation of original description:—Shell attached, inequivalve, irregular [in form]; valves joined by an exterior ligament, short, lateral, and by a sinuous hinge furnished with oblique fossettes, in which are enclosed corresponding projections, both being ornamented with a ligamental appendage.

323. *Mulleria dalyi*, Smith.

*Mulleria dalyi*, Smith, Proc. Malac. Soc. iii, 1898, p. 14, figs. in text; Woodward [Anatomy], tom. cit. p. 87, figs. in text.

*Original description*:—Testa irregulariter quadrata, sed postice producta et rotundata, compressa, inæquivalvis; valvæ mediocriter crassæ, intus margaritacæ, iridescentes, olivaceo plus minus maculatæ et ad marginem olivaceo-fusco limbatæ, extus sub periostraco subfibroso, nigro-fusco, fortiter concentrice striato, ex laminis albis calcareis et aliis corneis fusciscentibus constitæ; valva adhærens irregulariter planata, altera convexior, plus minus erosa; cicatrix musculi posterioris magna, elongata vel rotundata, mediocriter profunda, concentrice et radiatim striata; lineæ pallii irregularis, punctata, ad marginem superiori fere attingens; margo dorsi rectus, ligamento valido per totam longitudinem instructus.

Long. 52, lat. 65, diam. 20 mm.

*Hab.* Kadur District, Mysore.

After comparing it with the S. American species of the genus the author makes the following remarks "..... the nacre exhibits an iridescent mixture of white, bluish, greenish, olive and pinkish tints, whilst the margin is olive-brown. The exterior, also, is of a rich deep brown or blackish-brown ....."



For the anatomy of this interesting species it may be well to quote from the late Mr. Martin F. Woodward's invaluable paper on the subject:—

*"The Mantle and Muscular System:—*The mantle folds are almost completely separated from one another, being united at two points only, viz., at the posterior attachment of the gills, thus separating an inhalent from an exhalent orifice, and dorsally from the posterior end of the hinge-line for about one-quarter of the distance between this point and the attachment of the gills. The margins of the mantle below the attachment of the gills are beset with small sensory papillæ for a space which occupies about one-quarter of the extent of the mantle-margin from the attachment of the gills to the anterior hinge-line. . . . ."

*"A small posterior pedal retractor* is present in *Mulleria*, situated immediately above, or anterior to the posterior adductor, and exhibiting the typical relations of that muscle to the organ of Bojanus and to the nerve-cords."

*"The Mantle Cavity.—*The branchial cavity is large and entirely open below. The supra-branchial (anal) chamber opens posteriorly by a wide slit; it consists of a large median chamber behind the posterior adductor muscle, where it receives the opening of the anus. Under the adductor this chamber becomes divided into three by the union of the primary branchial filaments with the body-wall on either side."

"Still further forward, the middle of these three chambers becomes divided by the intervention of the visceral mass. In the relationship of this cavity to the surrounding parts, *Mulleria* resembles typical Eulamellibranchiata; there is, however, no communication, other than through the gill-slits, between the branchial and supra-branchial cavities, such as we meet with in a form like *Anodonta*."

"The external apertures of the organ of Bojanus, and of the genital gland, open into the innermost subdivision of the supra-branchial cavity."

*"The Foot and Visceral Mass.—*The muscular foot present in most lamellibranchiata is entirely wanting in *Mulleria*, a condition which is correlated with the fixed abode of life of this form . . . . ."

"The visceral mass is small and slightly bilobed posteriorly; it exhibits a few superficial muscular fibres mainly connected with the posterior pedal retractor."

*"The Labial Palps.—*Two pairs of very small leaf-shaped labial palps are present; they are equal in size, and exhibit oblique ridges on the opposed surfaces. The inner pair unite below the mouth to form the lower lip, while the outer pair, which become slightly expanded anteriorly, unite above the mouth."

*"The Respiratory and Circulatory Systems:—*The gills of *Mulleria* consist of two lamellæ on either side of the body; of these the outer is slightly the smaller. Their relations to each

other, to the mantle and to the body-wall, are those of a *typical Eulamellibranch*. The same is true of their more intimate structure, for an examination of sections under the microscope reveals the fact that the two halves of each gill lamella are connected together by vascular interlamellar junctions, and that the gill filaments themselves are further similarly united. In the individual filaments we find a supporting tissue, and firmer supporting rods are present. The whole structure recalls in its most minute details that of the gills of *Anodonta* or *Unio*."

"The heart consists of a muscular ventricle and two thin-walled auricles, the former giving origin to an anterior and a posterior aorta, the whole being enclosed in a fairly spacious pericardium. A mass of brown tissue forms the side-walls of the pericardium anteriorly; this evidently represents Keber's organ."

"The most striking feature seen in connection with the heart is the fact that the ventricle is not perforated by the rectum, but is situated some little distance below the latter, being separated from it by a portion of the genital gland. The pericardium, moreover, does not surround the rectum as in *Anodonta*, its roof being formed by the thick mass of the genital gland, within which the rectum lies embedded." . . . . .

"*The Kidney or Organ of Bojanus*.—The kidney . . . . . is essentially that of a typical Eulamellibranch, and closely resembles that of *Anodonta* in every detail."

"*The Genital Organs*.—A large genital duct opens close to, but perfectly independent of, the external opening of the kidney in the super-branchial chamber. The genital gland is extensive; it surrounds the coils of the intestine, and even extends round the rectum above the pericardium."

"*The Alimentary Canal*.—The mouth practically leads direct into the stomach, an œsophagus, as such, not being present. The digestive glands are situated below and at the sides of the stomach, into which they open. There is no crystalline style or "fêche tricuspid." The intestine is fairly long, and bent on itself several times; before leaving the visceral mass it enlarges abruptly; this point evidently represents the junction of the mid-gut with the hind-gut. The latter passes dorsally and continues to enlarge, becoming considerably dilated just in front of the heart; from this point it runs posteriorly, and gradually diminishes in size, finally opening into the super-branchial chamber above the adductor muscle. The hind-gut is characterized by the possession of a longitudinal infolding of its ventral wall, forming what is known as a typhlosole."

"*The Nervous System*.—The only point of interest connected with the nerves is the presence of well-developed pedal ganglia; this, in face of the entire suppression of the foot, suggests that the latter has only recently been aborted. The cerebro-pedal commissures are, however, somewhat short. Owing to the great transverse width of the mouth, the cerebral ganglia are widely separated, and their transverse connective is consequently long."

Suborder *CONCHACEA*.Family *GLAUCOMYIDÆ*.Subfamily *GLAUCOMYINÆ*.

Shell transversely elongate, thin, covered with a periostracum; hinge bearing three cardinal teeth in each valve: lateral teeth absent; ligament external, elongated; pallial line sinuous.

Animal inhabiting either fresh or brackish water; siphons very long, united; gills unequal, the external the smaller and appendiculate; foot small.

*Distribution.* India; China; Malaysia.

Genus *TANYSIPHON*.

*Tanysiphon*, Benson, A. M. N. II. ser. 3, i, 1858, p. 408, pl. 12.

TYPE, *Tanysiphon rivalis*, Benson, from Bengal.

*Range.* Gangetic Delta.

*Original description*:—"Testa subinæquivalvis, inæquilateralis, transverse oblonga, umbonibus prominentibus obtusis, extremitatibus (postica maxime) hiantibus, margine superiori subarcuato, ventrali subrecto. Cicatrix siphonalis elongata  $\frac{1}{6}$  longitudinis testæ invadens. Valvæ dextræ dentes tres, 1 anterior angustus prominens intrans, 2 laminares transversi, medianus prominens, posterior major obtusus; valvæ sinistrae dentes duo, anterior bilobatus, posterior major. Ligamentum duplex, externum parvum ellipticum, vix convexiusculum, internum lineare foveam posteriorem occupans, demum laminam cardinalem perpendiculariter truncans. Epidermis tenuis. Area interior testæ nitida, non margaritacea.

Some of the teeth are apt, in large specimens, to become obsolete.

Benson makes the following remarks on the animal:—

"The siphons closely resemble those organs in *Mya truncata*, Linn., Woodward, p. 317, fig. 220. Both are united in a finely annulated compressed scabbard nearly equalling the length of the shell. A raphe or seam appears along the inferior margin of the scabbard. The free extremity is surrounded by tentacula, which are distant, and of unequal length. The orifices of the siphons are papillar; that of the branchial siphon, the larger, is provided with minute tentacula, but the orifice of the exhalant siphon is naked. The small foot is hatchet-shaped, with the posterior margin notched. Both the siphons and the foot are wholly retractile, and highly sensitive. The foot is sometimes extended and tongue-shaped, but generally of the outline represented."

"The specimens received in spirits show that the mantle is closed at the basal edge, presenting narrow openings at either extremity for the passage of the siphonal sheath and foot. The suture is nearly straight, scarcely undulate. The foot is thick and cartilaginous, broad, and with a pit or depression at the anterior end, and laterally hamate, or bent like the crook of a walking-stick, the point being towards the hinge-side and the hinder edge straight, not concave."

324. *Tanysiphon rivalis*, Benson.

*Tanysiphon rivalis*, Benson, A. M. N. H. ser. 3, i, 1858, p. 408, pl. 12 B, figs. 1-3; H. & T., C. I. 1876, p. 47, pl. 116, figs. 1 & 4.

*Original description*:—Testa tenui, transverse oblonga, antice breviori obtusa, postice longiori, angustiori, extus tenuiter striata et irregulariter remote rugosa, epidermide pallide cornea; natibus decorticatis latis prominentibus, umbonibus obtusis; valvis male congruentibus, per spatium breve cardinale et ventrale solum tactum exhibentibus; humero umbonali antico breviter compressi-usculo; area interiori cærulescenti-alba.

Long. 11, lat. 21, diam. 9 mm.

*Hab.* Streams in the neighbourhood of Calcutta.

## Family CYRENIDÆ.

### Subfamily CYRENINÆ.

Shell equivalve, closing tightly, with umbones often eroded, covered with a periostracum, not pearly, trigonal or roundly ovate; hinge usually bearing two or three cardinal teeth and both anterior and posterior laterals; ligament external, prominent; pallial line simple or sinuous.

Animal fluviatile, lacustrine or estuarine; with anteriorly open mantle; generally furnished with two siphons of variable size, seldom a single (anal) one; foot large, without byssus in the adult state; palpes triangular; gills joined behind, unequal, the outer the shorter.

*Distribution.* Asia; Africa; America; Australia.

### Genus CYRENA.

*Cyrena*, Lamarck, Anim. s. Vert. v, 1818, p. 551.

*Venus* (pars), Chemnitz, Martini & Chemnitz, vi, 1782, p. 333, pl. 32, fig. 336.

*Cyclas* (pars), Bruguière, Encycl. Méth. 1792.

*Cyanocyclas*, Férussac, Dict. Sci. Nat. xii, 1818.

*Polymesoda*, Rafinesque, Ann. Gén. Sci. Phys. et Nat. v, 1820, p. 219.

*Maetra*, Brongniart, Mém. Vincent, 1823, p. 81, pl. 5, fig. 8.

*Gelonia*, Gray, Synop. Brit. Mus. 1844, p. 75.

*Cyrena*, Prime, Cat. Corbiculidæ, 1869-70, p. 141; Clessin, in Martini & Chemnitz, 1879, p. 101.

TYPE, *Cyrena ceylonica* (Chemnitz); Ceylon.

Range. Tropical and subtropical regions of Asia, Africa, Oceania and Australia.

Shell oval or subtrigonal, rather convex, solid, covered with a periostracum generally of a brownish-green or yellow hue; each valve bearing three somewhat divergent cardinal teeth; the right valve bearing four unequal short lateral teeth, of which the anterior are more nearly situate to the cardinals than the posterior, and the outer smaller than the inner; the left valve bearing but two lateral teeth, one anteriorly and one posteriorly; pallial line generally entire.

Animal with very short siphons, large, compressed, trigonal foot, gills of unequal size, and triangular labial palpes.

### 325. *Cyrena ceylonica* (Chemnitz).

*Venus ceylonica*, Chemn. in Martini & Chemnitz, vi, 1782, p. 333, pl. 32, fig. 336.

*Venus coxans*, Gmelin, Syst. Nat. 1788, p. 3278, fig. 336.

*Cyclas zeylanica*, Lamarck, Ann. Mus. Hist. Nat. vii, 1806, p. 420.

*Cyrena zeylanica*, Lamarck, An. sans Vert. v, 1818, p. 554; Prime, Cat. Corbiculidæ, 1863, p. 6.

*Cyrena ceylonica*, Lamarck, Prime, Cat. Corb., 1869-70, p. 143, Gen. *Cyrena*, no. 12; Clessin, in Martini & Chemnitz, 1879, pp. 102-103, pl. 17, figs. 1 & 2, pl. 18, figs. 1 & 2.

*Cyrena ceylanica*, Sowerby, Conch. Icon. xx, 1878, pl. 19, sp. 11.

Shell large, solid, subtrigonal, subcompressed, high, subequilateral, covered with a thin, yellowish epidermis, with fringed striæ: posterior side obtusely two-angled, rather concave in front of the anterior angle; flattened, much sloped behind the posterior angle; anterior side rather short, latero-dorsal flattened, sloped. (Sowerby.)

Hab. Ceylon.

The dimensions here given are those of three specimens in the British Museum Collection:—

	1.	2.	3.
Long. ....	62	51	47 mm.
Lat. ....	65	50	48.5 mm.
Diam. ....	35.5	27.25	27 mm.

### 326. *Cyrena impressa*, Deshayes.

*Cyrena impressa*, Deshayes, P.Z.S. xxii, 1854, p. 18; Cat. Brit. Mus. 1854, p. 249.

Original description:—Testa ovato-subcirculari, obscure subquadrangulari, valde inæquilaterali, turgida, mediocriter crassa;

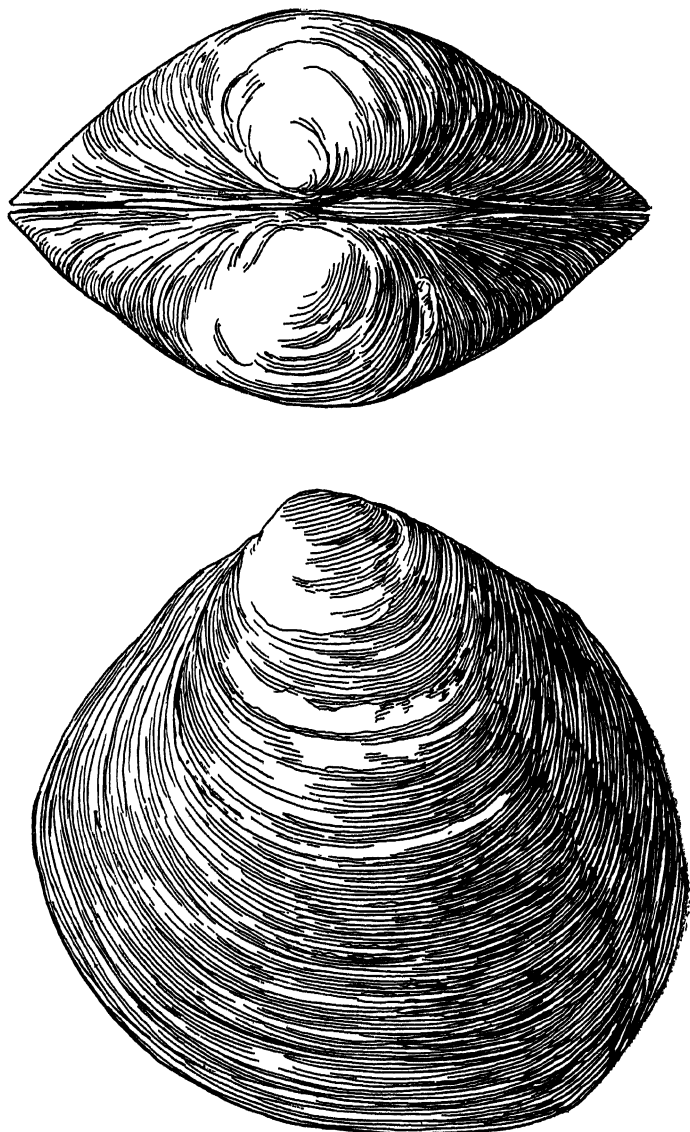


Fig. 25.—*Cyrena impressa*, Desh.  
(Type.) Nat. size.

epidermide viridi-glaucescente, transversim tenuissime laminata, postice inferneque atro-virente, lamellis sæpius crispis; umbonibus minimis, oblique antice curvatis, decorticatis, acutis, parum

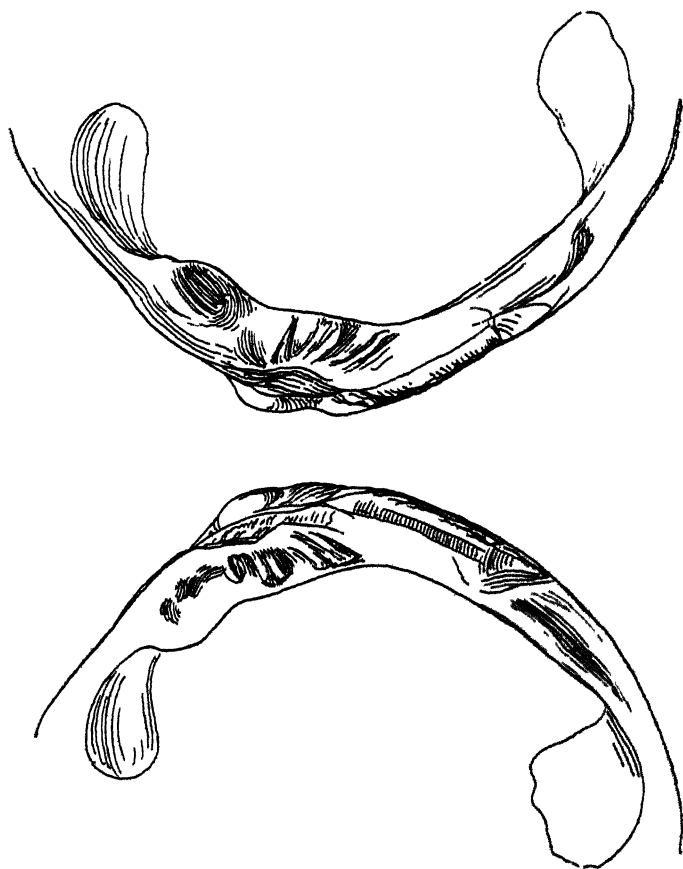


Fig. 26. — *Cyrena impressa*, Desh.; hinge of. Nat. size.

prominentibus; latere antico-declivi, rectilineo, inferne obtuso; margine superiore convexiusculo, postico latere subtruncato, sulco impresso ab umbone descendente distincto; lamina cardinali lata, dentibus primariis tribus augustis, elongatis, prominentibus, apice profunde furcatis, dente laterali antico conico, brevi, compresso, postico longiore.

Long. 87, lat. 92, diam. 52 mm.

*Hab.* Java (*Jukes*); Philippine Islands (*Cuming*); Australia; Ceylon (*vide* Brit. Mus.).

Type in the British Museum.

327. *Cyrena sinuosa*, Deshayes.

*Cyrena zeylanica*, Mousson, Moll. Java, 1849, p. 89, pl. 12.

*Cyrena sinuosa*, Desh., P. Z. S. xxii, 1854, p. 18; Cat. Brit. Mus., Conchif. 1854, p. 249; Prime, Cat. Corbiculidæ, 1863, p. 6, 1869-1870, p. 147, no. 70; Sowerby, Con. Icon. 1878, pl. 7, sp. 26; ? ? Clessin, in Martini & Chemnitz, 1879, pp. 228-229, pl. 45, fig. 1

*Original description*:—Testa ovato-rotundata, tumida, cordiformi, solida, valde inæquilaterali, epidermide fusco-fuliginosa, transversim tenue lamellosa vestita; latere antico brevi, rotundato, postico subtruncato, latere supero-posticali sulco, profundo, sinuoso, decurrente separato; umbonibus tumidis, brevibus, sæpius erosis; ligamento angusto, partim infosso; valvis intus albis; cardine crasso, utroque latere tridentato, dentibus obliquis, mediano et postico valvæ dextræ bifidis; dentibus lateralibus brevibus, antico crasso, conico, apice acuto.

*Hab.* Java. Ceylon *vide* Sowerby.

Type in the British Museum.

The following dimensions are those of specimens in the National Collection, nos. 1 and 2 being the type specimens from Java and no. 3 a specimen labelled "China."

	1.	2.	3.
Long. ....	68	63	73 mm.
Lat. ....	71	68	78 mm.
Diam. ....	43	38	42 mm.

Clessin's figure in the Conch. Cab. 1879, pl. 45, fig. 1 is certainly not that of Deshayes' species.

328. *Cyrena bengalensis*, Lamarck.

*Cyrena bengalensis*, Lamarck, Anim. sans Vert. v, 1818, p. 554; Delessert, Recueil, 1841, pl. 7, figs. 6 a-6 d; Prime, Cat. Corb., vi, 1865; 1869-70, p. 142, Gen. *Cyrena*, no. 5; Sowerby, Conch. Icon. xx, 1878, pl. 7, sp. 23; Clessin, in Martini & Chemnitz, 1879, pp. 107-108, pl. 13, figs. 1 & 2, pl. 17, figs. 4 & 6.

*Venus bengalensis*, Lister, Hist. An. pl. 345, fig. 182.

*Cyclas bengalensis*, Férussac, Cat. 1837, p. 20.

*Cyrena turgidæ*, Lea, Philadelphia, Pa., Trans. Amer. Phil. Soc. v, 1832, p. 109, pl. 18, fig. 51; Hanley, Descrip. Cat. 1844, p. 93, pl. 14, fig. 50.

Shell solid, tumid, thick, subtrigonal, blackish-brown, roughly striated; anterior side high, very short, sloped, full; posterior side produced, dorsal margin with a long slope, truncated at the end, very slightly excavated in front of the angle. (*Sowerby*.)

*Hab.* Bengal.



The following are the dimensions of three specimens in the British Museum Collection :—

	1.	2.	3.
Long. . . . .	47·25	42	41·25 mm.
Lat. . . . .	52·5	48	43 mm.
Diam. . . . .	31·75	26·5	28 mm.

329. *Cyrena tennentii*, Hanley.

*Cyrena tennentii*, Hanley, P. Z. S. xxvi, 1858, p. 23; Prime, Cat. Corbiculidæ, 1869-70, p. 148, no. 75; Clessin, in Martini & Chemnitz, 1879, p. 240.

*Original description*:—Testa ovato-subtrigona, solida, ventricosa, inæquilaterali, sublævigata, epidermide tenui impolita fusco-lutescente vestita: umbonibus tumidis, decorticatis, valde prominentibus, vix obliquis; latere antico anguste rotundato; latere postico longiore subattenuato, ad extremitatem obtuse rotundato; margine ventrali arcuato; margine dorsali antice declivi, convexo, postice subdeclivi, convexiusculo; lunula nulla; superficie interna albido-violascente; dentibus lateralibus brevibus, validis, obtusis; antico approximato, postico remoto: sinu palliari brevissimo, acutissimo.

Long. 27·75, lat. 38 mm.

*Hab.* Ariho River (flowing into the Gulf of Manaar), Ceylon.

In a note appended to the description the author states that " . . . . the hinge-margin is strong, and the cardinal teeth of the right valve peculiarly large. The inner disk, beneath the umbones, has a redder tint; there is neither a lunule, nor any indication of an umbonal ridge."

330. *Cyrena proxima*, Prime.

*Cyrena proxima*, Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1864, pp. 85-86, fig. 34.

*Original description*:—Testa ovato-suborbiculari, subæquilaterali, subinflata; latere antico rotundato, postico subobtusato; pagina interna candidissima; cardine crasso, lato; dentibus cardinalibus angustis, divergentibus, majoribus bifidis; umbonibus parvulis, integris, inclinatis, incurvis, approximatis; striis obsoletis; epidermide viridi, nitente induta.

Long. 63, lat. 67, diam. 37 mm.

*Hab.* Siam; Sulinan Island, Mergui (*vide* Brit. Mus.).

The following note is appended to the description :—

"The shell is oval-suborbicular, nearly equilateral, and somewhat inflated. The anterior side is rounded, the posterior is subobtusate. The beaks are small, they curve inwardly and are approximate. The valves are solid. The interior is white. The hinge is broad. The cardinal teeth are narrow and divergent, the two principal ones are bifid. The anterior lateral tooth is

conical and the posterior are somewhat elongated and flattened. The striæ are more or less obsolete. The epidermis is light green and polished. The ligament is narrow, elongated, and not prominent."

The only specimens of this species which the author has been able to see are those in the British Museum, two in number, which, though they agree well with Prime's description and figure, are much smaller, having somewhat the appearance of young specimens; their measurements being as below:—

	1.	2.
Long. ....	43	46 mm.
Lat. ....	47·5	49 mm.
Diam. ....	24	24·5 mm.

### 331. *Cyrena galathea* (Mörch).

*Cyrena* (*Corneocyclas*) *galathea* (Reinhardt MS.), Mörch, Cat. Conch. Kierulf, 1850, p. 32, pl. 2.

*Cyrena galathea*, Prime, Cat. Corb., 1863, p. 6; 1869–70, p. 144, no. 33.

*Original description*:—Testa cordato-trigona, inæquilatera, turgida, concentrice striata, postice longiore, truncata, antice et inferne angulata, umbonibus distantibus, prominentibus ad  $\frac{1}{3}$  anter. sitis; lunula rhomboidali, medio carinata; area lanceolata, convexa, ligamento tumido duplo longiore. Dentibus lateralibus interne fovea impressa; d. l. posteriore v. sin. triangulari compresso; pone ligamentum sito; d. lunulari v. s. conico, dentibus cardinalibus aproximato. Dentium cardinalium 2 anterioribus v. s. et 2 posterioribus v. d. bifidis, dente card. posteriore v. s. lineari, v. d. obsoleto. Limbo Augusto, nitido. Impressione musculari semilunari, posteriore rhomboidali, duplo majore. Colore albo, dentibus cardinalibus et fundo cavitatis flavescentibus. Epidermide nigrescente, antice radiis obsoletis.

Long. 100, lat. 120, diam. 74 mm.

*Hab.* Galatea River, Nicobar Islands.

### Genus BATISSA.

*Batissa*, Gray, A. M. N. H. ser. 2, xi, 1853, p. 38.

*Cyprina*, *Cyclas*, Bruguière, Encycl. Méth. 1792.

*Cyrena*, Lamarck, Anim. s. Vert. v, 1818, p. 553.

*Venus*, Gray, in Wood, Index Test, Suppl. 1828, pl. 2, fig. 13; Deshayes, Cat. Brit. Mus. 1854, p. 219; Prime, Cat. Corbiculidæ, 1869–70, p. 138; Clessin, in Martini & Chemnitz, Conch. Cab. 1879, p. 206.

TYPE, *Batissa tenebrosa*, Hinds, from the Fiji Islands.

Range. Nicobar Islands; Malay Archipelago; N. Australia and Tropical Islands of the Pacific.

Shell roundedly ovate or subtrigonal, solid, thick, dorsal margin, bearing on each valve three divergent cardinal teeth; lateral teeth curved, elongated, striate, unequal, shorter in front than behind, double on the right valve; ligament large, projecting, thick; pallial impression simple or subsinuuous.

Animal having two short siphons, united at their base; mantle lobes simple or fringed.

**332. *Batissa inflata*, Prime.**

*Batissa inflata*, Prime, P.Z.S. xxviii, 1860, p. 320; Cat. Corbiculidæ, 1869-70, p. 139; Sowerby, Conch. Icon. ix, 1878, pl. 4, sp. 10; Clessin, in Martini & Chemnitz, 1879, pp. 218-219.

*Original description*:—Testa magna, orbiculari, inæquilaterali, crassa, solida, obtusa, epidermide rugosa, fusco-nigrescente vestita; umbonibus productis, erosio obliquis; valvis intus albis et violaceis; dentibus cardinalibus crassis, subæqualibus; lateralibus angustis.

Long. 83, lat. 96, diam. 57 mm.

*Hab.* Nicobar Islands.

**333. *Batissa similis*, Prime.**

*Batissa similis*, Prime, Ann. Lyc. Nat. Hist., N.Y. vii, 1859, p. 112; viii, 1860, p. 229, fig. 60; Cat. Corbiculidæ, 1863, p. 5; 1869-70, p. 140, no. 25; Clessin, in Martini & Chemnitz, 1879, p. 213, pl. 36, fig. 3.

*Original description*:—Testa ovato-orbiculari, oblique inæquilaterali, tumida, solida, depressa, intus superne alba, postice inferneque violacea, epidermide nigra vestita, sulcis remotis, umbonibus profunde erosio; dentibus cardinalibus tribus, subæqualibus, caniculatis; lateralibus elongatis, angustis, subæqualibus, serrulatis.

Long. 53, lat. 79, diam. 34.5 mm.

*Hab.* Nicobar Islands.

**334. *Batissa capillata*, Preston.**

*Batissa capillata*, Preston, Rec. Ind. Mus., Calcutta, ii, 1908, p. 207, pl. 16, fig. 39.

*Original description*:—Shell subtrigonal, inequilateral, thick, rather inflated, covered with a dark, brownish-black periostracum except in the umbonal region where erosion has taken place, sculptured with coarse, irregular, concentric growth-lines which are obliquely crossed posteriorly with coarse hair-like ridges; anterior side somewhat angularly rounded; posterior side slightly produced, obscurely angled; ventral margin rounded; ligament large, prominent; cardinal teeth broad and very coarse; anterior lateral teeth elongated, finely striate; interior of shell purplish-white, the purple staining deepening posteriorly.

Long. 74, lat. 72 mm.

*Hab.* Andaman Islands (*Warneford*).

Genus **VELORITA.**

*Velorita*, Gray, 1834, in Griffith, Animal Kingdom, xii, 1834, pl. 31, fig. 5 (misprinted *Villorita*); Synops. B. M. 1842, p. 75; P. Z. S. xii, 1847, p. 184; A. M. N. H. ser. 2, xi, 1853, p. 38.

*Cyrena*, Gray, Ann. Phil. n. ser. ix, 1825, p. 137.

*Venus*, Gray, in Wood, Index Test., Suppl. 1828, pl. 2, fig. 14.

*Villorita*, Dunker, 1846 (misprint), *Cyrenodontæ*, Johannis, Mag. Zool. 1836, pl. 70.

*Velorita*, Deshayes, Cat. Brit. Mus., Conchif. p. 240; Prime, Cat. Corbiculidæ, 1869-70, p. 141; Clessin, in Martini & Chemnitz, 1879, p. 224.

TYPE, *Velorita cyprinoides*, Gray, from the Philippine Islands.

Range. S. India and the Philippines.

Shell triangularly cordiform, solid, with well marked lunule; umbones prominent; dorsal margin thick; hinge bearing on each valve three oblique cardinal teeth of which the anterior in the right and the posterior in the left valve are obsolete; lateral teeth finely striate: the anterior short, strong, triangular, closely situated to the cardinal teeth; the posterior compressed, elongated, diverging; pallial line leaving a sinus scarcely noticeable at its junction with the posterior adductor impression of the valves. Animal unknown.

335. *Velorita cyprinoides* (Gray).

*Cyrena cyprinoides*, Gray, Ann. Phil. n. ser. ix, 1825, p. 136.

*Venus cyprinoides*, Gray, Wood, Index Test., Suppl. 1828, pl. 2, fig. 14.

*Velorita cyprinoides*, Gray in Griffith, Animal Kingdom, xii, 1834, pl. 31, fig. 5; Deshayes, Cat. Brit. Mus., Conchif. 1854, pp. 240-241; Prime, Cat. Corbiculidæ, 1869-70, p. 141, no. 2; Clessin, in Martini & Chemnitz, 1879, pp. 224-295, pl. 42, figs. 3 & 4.

*Original description*:—Testa cordato-trigona, gibba, olivacea, concentrice sulcata; cardine incrassata, dentibus lateralibus lævibus, anteriori conico cæteris approximato.

Long 31·5, lat. 33·5 mm.

The habitat is undoubtedly Southern India, the original locality "Japan" and later "? Philippines," the latter quoted by Prime in his 'Cat. Corbiculidæ,' are certainly both erroneous.

The following dimensions are taken from authentic Malabar Coast specimens in the British Museum:—

	1.	2.	3.
Long. ....	41	31	29 mm.
Lat. ....	39	29	28·5 mm.
Diam. ... ..	30	22·5	21 mm.

336. *Velorita cochiniensis* (Hanley).

*Cyrena cochiniensis*, Hanley, P. Z. S. xxvi, 1858, p. 543.

*Cyrena corbiculiformis*, Prime, Proc. Acad. Nat. Sci. Philadelphia, 1860, p. 80; Cat. Corbiculidæ, 1863, p. 6.

*Velorita cochiniensis*, Hanley, Ann. Lyc. Nat. Hist. N.Y. viii, 1866, p. 236, fig. 66; Prime, Cat. Corbiculidæ, 1869-70, p. 141, no. 1; Clessin, in Martini & Chemnitz, 1879, p. 225, pl. 36, figs. 5 & 6.

*Original description*.—Testa cordata, crassa, valde inæquilate obliqua, ventricosa seu tumida, epidermide nitente, nigro-fuscescente vestita, sulcis remotiusculis antice exarata, postice magis minusve lævigata; extremitate lateris antici perbrevis rotundata; lateris postici attenuati productique, in adultis obtusa, in junioribus rotundato-acuminata: margine ventrali arcuato antice valde, postice parum acclivi: natibus obliquis, erosio, prominentibus: lunula nulla, loco ejus autem sulcorum experte: area dorsali postica lata, retusa: superficie interna alba, margine cardinali violaceo sparso, concavitate nonnunquam rubescente, sinu palliari vix ullo: dentibus primariis vix emarginatis; lateralibus haud manifeste striatis, sub lente autem minutissime corrugato-granosis, antico brevi et valde approximato, postico elongato et remotiore.

Long. 47, lat. 38 mm.

*Hab.* Cochin.

In a note following the original description, the author makes the following remarks:—".... The primary teeth are somewhat peculiar, and have a tendency to shelve outwards; the hinder and central ones are not strictly bifid, but exhibit a kind of shallow sublateral grooving; the front one in the right valve is very short, and simply pyramidal. The beaks are probably acute when young; the surface below the epidermis is reddish purple."

The following measurements are taken from three specimens in the British Museum, labelled as coming from the Malabar Coast:—

	1.	2.	3.
Long. ....	34	35	32 mm.
Lat. ....	36.25	35.75	33 mm.
Diam. ....	23.5	25.5	22 mm.

## Genus CORBICULA.

*Corbicula*, Megerle, Mag. Gesell. Naturf. Berlin, v, 1811, p. 56.

*Tellina* (pars), Muller, Verm. ii, 1774, p. 205.

*Venus* (pars), Chemnitz, in Martini & Chemnitz, Conch.-Cab. vi, 1782, p. 320.

*Cyclas* (pars), Bruguière, Encycl. Méth. 1792.

*Cyrena*, Lamarck, Anim. sans Vert. v, 1818, p. 552.

*Venulites*, Schloth, Petref. 1820, p. 200.

TYPE, *Corbicula fluminalis*, Megerle.

Range. Tropical and subtropical regions of the world.

Shell subtrigonal or cordiform, subequilateral; with umbones prominent, concentrically grooved; hinge bearing three divergent cardinal teeth in each valve; lateral teeth elongated, compressed, lamelliform, finely striate; right valve having two lateral teeth both anteriorly and posteriorly, the left valve having but one on each side; pallial line usually continuous.

Animal having the edge of the mantle ornamented with small conical tentacles; siphons very short, closely situate; orifices papillary; foot tongue-shaped, rather large, laterally compressed; palpes triangular, large; gills joined behind.

### 337. *Corbicula fluminalis* (Müller).

*Tellina fluminalis*, Müll. Verm. ii, p. 205.

*Venus fluminalis*, Chemn. in Conch.-Cab. vi, p. 319, pl. 30, fig. 320; Wood, Ind. Test. pl. 8, fig. 113.

*Tellina fluminalis*, Schröter, Flussconch. p. 195, no. 20; Gmel. S. N. p. 3242, no. 79.

*Cyclas fluminalis*, Blainv. D. S. N. xii, p. 280.

*Cyrena fuscata*, var. ?, Lamk. An. s. Vert. v, p. 522, no. 4.

*Corbicula fluminalis*, Deshayes, Cat. Brit. Mus., Conchif. 1854, pp. 222-223.

*Original description*:—Testa crassa, dura valde gibba, opaca, antice versus cardinem latior, quam postice, extus viridis crebro striatim imbricata; striæ aperturæ parallelæ. Intus cyanea; cardinis dentes medii sex cum fossulis, tres nempe in quavis valvula, utriusque ligamento proximus emarginatus est; laterales utrinque elongati, sulcique excipientes, crenulati sunt.

*Hab.* India, etc.

The following dimensions are those of two specimens in the British Museum:—

	1.	2.
Long. ....	39.25	38 mm.
Lat. ....	45	43.25 mm.
Diam. ..	26	23.5 mm.

Var. *holstiana*, Schlesch, Calcutta, Rec. Ind. Mus. ii, 1908, p. 108.

Said to be more arched than the typical form.

*Hab.* Hoti-Mardan, near Peshawar.

### 338. *Corbicula fluminea* (Müller).

*Tellina fluminea*, Müll. Verm. ii, p. 206; Gmel. S. N. p. 3243, no. 80.

*Cyclas fluminea*, Blainv. D. S. N. xii, p. 280.

*Venus fluminea*, Chemn. in Conch.-Cab. vi, p. 320, pl. 30, figs. 322, 323, an eadem species?; Schröter, Einl. iii, p. 159, no. 13; Wood, Ind. Test. pl. 8, fig. 114.

*Tellina fluvialis*, Schröter, Flussconch. p. 193, pl. 4, figs. 2a & b.

*Cyrena fluminea*, Lamk. An. s. Vert. v, p. 553, no. 5; Hanley, Descr. Cat. p. 92; Philippi, Abbild. Conch. p. 2, no. 3, pl. 1, fig. 3, *an eadem species?*; Mousson, Moll. de Java, p. 87, no. 2, pl. 15, fig. 3.

*Original description*:—Testa gibba, opaca, antice et postice versus cardinem fere æqualis, extus viridis, costis latis transversis quasi circulis doliaribus circumdata; intus albida semicirculo nigro notata. Cardinis dentes et fossulæ, uti in præcedente.

*Hab.* India, etc.

The dimensions given below are those of three specimens in the British Museum:—

	1.	2.	3.
Long. ....	35·25	37	32·5 mm.
Lat. ....	42	41·25	37 mm.
Diam. ....	23	29·25	23 mm.

### 339. *Corbicula fluviatilis* (Müller).

*Tellina fluviatilis*, Muller, Verm. ii, 1774, p. 206.

*Cyclas fluviatilis*, Blainv. D. S. N. xii, p. 280.

*Venus fluviatilis*, Chemnitz, Conch.-Cab. vi, p. 330, pl. 30, fig. 321; Wood, Ind. Test. pl. 8, fig. 115.

*Cyrena fuscata*, Lamk. An. s. Vert. v, p. 552, no. 4, exclus. var.

*Cyrena fluviatilis*, Philippi, Abbild. Conch. p. 3, no. 5, pl. 1, fig. 5.

*Cyrena manilensis*, Philippi, Zeitschr. für Malak. 1841, p. 163.

*Corbicula fluviatilis*, Deshayes, Cat. Brit. Mus., Conchif. 1854, p. 226; Prime, Cat. Corb. 1869-70, Gen. *Corbicula*, no. 41, p. 132; Clessin, in Martini & Chemnitz, 1879, pp. 151-152, pl. 27, figs. 3-5.

*Original description*:—Testa latior et tenuior proxime præcedentibus, fusco-virens, in cardine antice et postice æqualis latitudinis, lineis elevatis cincta area interjecta angustior, quam in *T. [C.] fluminea*, variolosa. Facies interna dentesque cardinis uti in proxime præcedentibus.

*Hab.* India, etc.

The dimensions of a specimen in the British Museum Collection are:—Long. 17, lat. 19·25, diam. 12·25 mm.

### 340. *Corbicula parvula*, Prime.

*Corbicula parvula*, Prime, Proc. Acad. Nat. Sci. Philad. 1861, p. 127; Cat. Corb. 1863, p. 4; Ann. Lyc. Nat. Hist. N.Y. viii, 1864, p. 76, fig. 25; Cat. Corb. 1869-70, no. 70.

*Original description*:—Testa ovato-transversa, depressiuscula, tenui, æquilaterali, extremitatibus rotundata; umbonibus magnis, tumidis, erosis; sulcis irregularibus; epidermide viridi flavescente, irregulariter maculata vestita; intus pallide violacea; dentibus primariis crassis, lateralibus æqualibus.

Long. 10, lat. 12, diam. 5 mm.

*Hab.* India.

341. *Corbicula agrensis*, Prime.

*Corbicula agrensis*, Prime, Proc. Acad. Nat. Sci. Philad. 1861, p. 128; Cat. Corb. 1863, p. 3, Ann. Lyc. Nat. Hist. N.Y. viii, 1864, p. 75, fig. 24; Clessin, in Martini & Chemnitz, 1879, p. 175, pl. 30, fig. 23.

*Original description*:—Testa ovato-transversa, æquilaterali, lævigata, depressiuscula, extremitatibus rotundata; epidermide viridi-olivacea induta; sulcis regularibus, distantibus; intus pallide violacea; umbonibus tumidis, erosis; cardine angusto, dentibus cardinalibus crassis, lateralibus æqualibus tenuiter serrulatis.

Long. 8, lat. 8, diam. 5 mm.

*Hab.* Agra.

342. *Corbicula subradiata*, Prime.

*Corbicula subradiata*, Prime, Proc. Acad. Nat. Sci. Philad. 1861, p. 127; Cat. Corb. p. 4, 1863; Ann. Lyc. Nat. Hist. N.Y. viii, 1864, p. 75, fig. 23, Clessin, in Martini & Chemnitz, 1879, p. 174, pl. 30, fig. 21.

*Original description*:—Testa trigona, æquilaterali, compressiuscula, antice paulo latiore et obtusiore, striis regularibus, epidermide viridi, nitente induta; intus pallide violacea; umbonibus minimis, acutis antice obliquatis, violaceo-subradiatis cardine angusto, dentibus primariis crassis.

Long. 12, lat. 14, diam 7 mm.

*Hab.* India.

343. *Corbicula cashmirensis*, Deshayes.

*Corbicula cashmirensis*, Deshayes, P. Z. S. xxii, 1854, p. 344; Cat. Brit. Mus., Conchif. p. 224; Prime, Cat. Corb. 1869-70, Gen. *Corbicula*, no. 18; H. & T., C. I. 1876, p. 55, pl. 138, figs. 2 & 3; Clessin, in Martini & Chemnitz, 1879, p. 166, no. 57, pl. 29, figs. 17 & 18.

*Original description*:—Testa ovato-transversa, subtrigona, æquilaterali, tumidula, transversim tenue et regulariter striata, striis postice evanescentibus, epidermide nitida, atro-virescente, in latere postico tenuissime striata vestita; umbonibus tumidis, prominentibus, profunde erosis, violaceis; cardine angusto, in valva dextra bidentato, in altera tridentato, valvulæ dextræ dente antico laterali adnato, dentibus primariis divergentibus, simplicibus, lateralibus longis, angustis, antico longiore, cardine proximo; valvis intus violaceis, impressione pallii margine valde remota.

*Hab.* Cashmir; also recorded from Beluchistan, Ayantipura, etc.

Of the following dimensions (none having been given with the description), Nos. 1, 2, & 3 are taken from the three specimens



which form the type series; the dimensions of No. 4 are those of the specimen figured by Hanley and Theobald in the Conch. Ind. All four are now in the British Museum.

	1.	2.	3.	4.
Long. ....	32·25	30	33	25·75 mm.
Lat. ....	37	36	38·5	29 mm.
Diam. ....	10·25	20·5	12	16 mm.

### 344. *Corbicula trigona*, Deshayes.

*Corbicula trigona*, Deshayes, P. Z. S. xxii, 1854, p. 344; Cat. Brit. Mus., Conchif. p. 224; Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1866, p. 221, fig. 53; Cat. Corb. 1869-70, Gen. *Corbicula*, no. 102; H. & T., C. I. 1876, p. 62, pl. 155, fig. 7; Clessin, in Martini & Chemnitz, 1879, p. 203, no. 126.

*Original description*:—Testa trigona, æquilaterali, compressiuscula, antice paulo latiore et obtusiore, utroque latere æqualiter declivi, transversim tenue et regulariter striata, epidermide viridi, nitente induta, intus pallide violacea; umbonibus minimis, brevibus acutis; lunula ovata, angulo obsoleto circumscripta, pallida lævigata; cardine angusto, bidentato, altero tridentato; dentibus lateralibus æqualibus, tenuissime striatis, antico leviter arcuato.

*Hab.* Pondicherry.

The dimensions given below are taken from three specimens in the type series in the British Museum:—

	1.	2.	3.
Long. ....	11·25	10	10·75 mm.
Lat. ....	12·75	11·75	12·25 mm.
Diam. ....	7	*3	7 mm.

\* Single valve.

### 345. *Corbicula striatella*, Deshayes.

*Corbicula striatella*, Deshayes, P. Z. S. xxii, 1854, p. 344; Cat. Brit. Mus., Conchif. p. 224; Hanley, Photog. Conch.; Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1864, p. 74, fig. 22; H. & T., C. I. 1876, p. 55, pl. 138, figs. 7 & 10; Clessin, in Martini & Chemnitz, 1879, p. 167, no. 58, pl. 29, figs. 19 & 20, pl. 30, fig. 20.

*Corbicula violacea*, Prime, op. cit. 1861, p. 28, *teste* Prime; Proc. Acad. Nat. Sci. Philad. 1861, p. 128.

*Original description*:—Testa ovato-transversa, depressiuscula, subæquilaterali, extremitatibus æqualiter obtusa, transversim regulariter lirata, liris ad latus posticum evanescentibus, epidermide pallide virescente, nitida vestita, intus atro-violacea; umbonibus brevibus, atro-violascentibus, pallidiore biradiatis;

cardine angusto, tridentato, dentibus inæqualibus, divaricatis, postico longiore et angustiore, dentibus lateralibus elongatis, angustis subæqualibus, arcuatis, tenuissime striatis.

*Hab.* Pondicherry; also recorded from Scinde.

The dimensions of Nos. 1 and 2, as given below, are those of the two type specimens; those of No. 3 refer to the largest Scindian specimens. All are in the British Museum.

	1.	2.	3.
Long. . . . .	14.25	10	18.5 mm.
Lat. . . . .	18 .	12.25	21 mm.
Diam. . . . .	10	6.25	12.75 mm.

### 346. *Corbicula huttoniana*, Clessin.

*Corbicula huttoniana*, Clessin, Mal. Blatt. ix, n. f. 1887, pp. 77-78, pl. 3, fig. 5.

*Original description*:—Testa mediocris, ovata, subæquilateralis, solidula, modice inflata, nitidula, anguste regulariterque sulcata; epidermide flavescente vel fuscescente; antice vix acuminatim rotundata; postice rotundata; umbonibus modice inflatis et prominentibus; margine dorsali valde arcuato, marg. postico et antico rotundata, marg. ventrali convexo; ligamentum curtum, tenue; lunula profunda, elongata; cardine modice angusta; dentibus lateralibus æqualibus; margarita violacea.

Long. 17, lat. 21, diam. 11 mm.

*Hab.* Ahimabad.

### 347. *Corbicula subnitens*, Clessin.

*Corbicula subnitens*, Clessin, Mal. Blatt. ix, n. f. 1887, p. 77, pl. 3, fig. 5.

*Original description*:—Testa parva, triangulata, tenuis, ventricosa, subæquilateralis, paullulum nitidula, levissime irregulariterque striata, obscure olivaceo-viridescente; antice rotundata; postice acuminatim rotundata; umbonibus inflatis, prominentibus; margine dorsali arcuato; marg. postico et antico rotundato; marg. ventrali convexo; ligamentum curtum, læve; lunula inconspicua; cardine angustissimo; dentibus lateralibus subæqualibus; margarita violacea.

Long. 13, lat. 13, diam. 12 mm.

*Hab.* Ceylon?

### 348. *Corbicula solida*, Clessin.

*Corbicula solida*, Clessin, Mal. Blatt. ix, n. f. 1887, p. 76, pl. 3, fig. 4.

*Original description*:—Testa parva, fere triangulata, subæquilateralis, solidissima, nitidula, epidermide olivaceo-flavescente,

regulariter anguste sulcata; antice paullulum acuminata, postice subtruncata; umbonibus inflatis, valde prominentibus, erosis; margine dorsali fere angulato, marg. antico rotundato, marg. postico rotundato, marg. ventrali valde convexo; ligamentum curtum, solidum, lunula triangulata; cardine valde incrassato; dentibus cardinalibus crassis; dent. lateral. paullulum arcuatis, subæqualibus; margarita suturate violacea.

Long. 12, lat. 11·5, diam. 10 mm.

*Hab.* Ceylon.

Type in the British Museum.

### 349. *Corbicula nevilli*, Clessin

*Corbicula nevilli*, Clessin, Mal. Blätt ix, n. f. 1887, pp. 70-71, pl. 2, fig. 5.

*Original description*:—Testa parvula, modice solidula, ovato-rotundata, nitidula, sulcis distantibus ornata, epidermide flavescente; antice vix subacuminata, rotundata; postice subtruncata, umbonibus paullulum elevatis, erosis; margine dorsali valde arcuato, marg. antico rotundato, m. postice rotundato, m. inferior convexo; ligamentum crassum; lunula profunda; cardine incrassato; dentibus cardinalibus tenuibus; dent. later. subæqualibus, subarcuatis; margarita violacea, sub umbo. pallida.

Long. 12, lat. 14·5, diam. 9 mm.

*Hab.* Assam.

### 350. *Corbicula occidens*, Deshayes.

*Corbicula occidens*, Deshayes, Cat. Brit. Mus. Conchif. 1854, p. 223; Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1866, p. 220, fig. 51; H. & T., C. I. p. 55, pl. 138, figs. 8, 9.

*Original description*:—Testa ovato-transversa, æquilaterali, tumida, tenui, transversim regulariter lirato-sulcata; epidermide flavescendo-viridi vestita, ad umbones atro-violascente vel breviter albo radiata; umbonibus tumidis, brevibus, lævigatis; lunula ovato-lanceolata, pallida, lævigata; valvis intus profunde fusco-violascentibus; cardine angusto, inæqualiter tridentato; dentibus lateralibus brevibus angustis albis tenue striatis.

*Hab.* Sikkim; Moradabad, Bengal.

The dimensions given below are taken from three specimens in the British Museum:—

	1.	2.	3.
Long. ....	13·25	11·25	12·25 mm.
Lat. ....	16	13·25	15 mm.
Diam. ....	8	7	7·75 mm.

### 351. *Corbicula iravadica*, Blanford.

*Corbicula iravadica*, Blanford, J. A. S. B. xlix, 1880, pp. 221-222; H. & T., C. I. 1876, p. 62, pl. 115, fig. 8.

*Original description*:—Testa fere æquilateralis, rhomboideo-ovata, ventricosa, solidiuscula, concentrice striato atque costulis subremotis, interdum plus minusve obsoletis, ornata, epidermide olivacea induta, intus violacea: latere antice ante umbones prominentes subhorizontali; tunc fere regulariter convexo, postico declivi, oblique subtruncatulo, demum subangulato, margine ventrali modice arcuato; ligamento postice subito contracto.

Long. 9, lat. 10·5, diam. 7 mm.

The author also gives the dimensions of another specimen as:—

Long. 8·5, lat. 11·5, diam. 7 mm.

*Hab.* Mandalay.

### 352. *Corbicula regularis*, Prime.

*Corbicula regularis*, Prime, P. Z. S. xxviii, 1860, pp. 321-322; Cat. Corb. 1869-70, Gen. *Corbicula*, p. 136, no. 90; H. & T., C. I. 1876, p. 55, pl. 138, figs. 5, 6; Clessin, in Martini & Chemnitz, 1879, p. 202.

*Original description*:—Testa ovato-transversa, æquilaterali, intus violacea, epidermide viridi-flavescente; umbonibus disparibus; dentibus cardinalibus tribus, inæqualibus, lateralibus prælongis, striatis.

Long. 17·75, lat. 22·75, diam. 11 mm.

*Hab.* Deccan; also recorded from Madras.

### 353. *Corbicula bengalensis*, Deshayes.

*Corbicula bengalensis*, Deshayes, P. Z. S. 1854, p. 344; Cat. Brit. Mus., Conchif. p. 224; Prime, Cat. Corb. 1864, p. 4; 1869-70, Gen. *Corbicula*, p. 128, no. 10; Ann. Lyc. Nat. Hist. N.Y. viii, 1866, p. 200, fig. 52; H. & T., C. I. 1876, p. 62, pl. 155, fig. 6 (*Corbicula bengalica* [sic], Deshayes); Clessin, in Martini & Chemnitz, 1879, pp. 138-139, pl. 24, fig. 20.

*Original description*:—Testa ovato-subtrigona, depressiuscula, tenui, subæquilaterali, obsolete transversim striata, striis, regularibus, distantibus, epidermide flavescente, nitidissima, intus alba, in medio macula rubescente notata; umbonibus minimis acutis; cardine angusto, tridentato, altero bidentato; dentibus lateralibus angustissimis, argute striatis.

*Hab.* Bengal; also recorded from the River Jumna.

The dimensions given below are taken from the two specimens forming the type series in the British Museum:—

	1.	2.
Long. ....	8	8 mm.
Lat. ....	10	9·75 mm.
Diam. ....	5	*2 mm.

\* Single valve.

354. *Corbicula bensoni*, Deshayes.

*Corbicula bensoni*, Deshayes, P. Z. S. xxii, 1854, p. 345; Cat. Brit. Mus., Vener. p. 224.

*Corbicula bensoni*, Desh., Prime, Cat. Corb. 1869-70; Gen. *Corbicula*, p. 128, no. 11.

*Corbicula bensoni*, H. & T., C. I. 1876, p. 55, pl. 138, figs. 1, 4; Clessin, in Martini & Chemnitz, 1879, p. 198, no. 111.

*Original description*:—Testa ovato-transversa, subtrigona, æquilaterali, lævigata, nitida, depressiuscula, extremitatibus, obtusa, utroque latere æqualiter declivi, epidermide tenui, nitente, virescente vel flavescente induta, aliquantisper lineis interruptis, fuscis radiata, intus alba, vel pallide violascente; cardine angusto, tridentato, dentibus inæqualibus valde divaricatis, dentibus lateralibus prælongis, angustissimis, tenuissime striato-crenatis, antico paullo longiore.

*Hab.* Bengal; also recorded from the River Jumna.

The dimensions given below are taken as follows:—No. 1 from the single valve representing the type, and Nos. 2 and 3 from two other specimens in the British Museum:—

	1.	2.	3.	
Long. . . . .	7.5	7	7	mm.
Lat. . . . .	9.25	9.5	9.25	mm.
Diam. . . . .	*2	4.25	*2	mm.

\* Single valves.

355. *Corbicula consanguinea*, Prime.

*Corbicula consanguinea*, Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1867, p. 417; Cat. Corb. 1869-70, p. 129, no. 22; Clessin, in Martini & Chemnitz, 1879, p. 199.

*Original description*:—Testa ovato-transversa, compressiuscula, æquilaterali; epidermide viridescens, nitente vestita; regulariter striata; umbonibus brevibus, atro-violascentibus; valvis intus violaceis; cardine lato.

Long. 14, lat. 16, diam. 9 mm.

*Hab.* India.

The type is inaccessible to the compiler of the present volume; the author, however, states that though closely allied to *C. striatella*, Deshayes, the lateral teeth are stronger and much broader in the present species.

356. *Corbicula sylhetica*, Preston.

*Corbicula sylhetica*, Preston, Rec. Ind. Mus. Calcutta, ii, 1908, pp. 47-48 (fig. in text).

*Original description*:—Shell nearly equilateral, tumid, sub-trigonal, pale olive-green, sculptured with fine irregular concentric

striæ; anterior side rounded; posterior side somewhat angularly rounded; lateral margins sloped; ventral margin rounded, slightly contracted towards the posterior side; umboes large; interior of shell purplish-white.

Long. 10·5, lat. 12 mm.

*Hab.* Phenchooganj, Sylhet, Assam.

Type in the Indian Museum, Calcutta.

Allied to *C. iravadica*, Benson, but is more trigonal and more swollen.

### 357. *Corbicula quilonica*, Benson.

*Corbicula quilonica*, Benson, A. M. N. H. ser. 3, vi, 1860, p. 260

*Corbicula quilonensis* [sic] Benson, Prime, Ann. Lyc. Nat. Hist. N.Y. viii, 1866, p. 224, fig. 56; Cat. Corbiculidæ, 1869-70, p. 135, no. 87; Clessin, in Martini & Chemnitz, 1879, p. 135, pl. 24, fig. 10.

*Original description*:—Testa inæquilaterali, trigono-rhomboidea, gibba, tenui, concentrice subremote costata, costis postice evanescentibus, sulcis intermediis latioribus, sub lente decussatim striatis, albida vel lutea, radiis fuscis angustis ornata; umbonibus prominentibus, apice fere eroso; latere antico brevior, valde arcuato, angustiore, postico striato, latiore; superne et basin versus angulata; margine ventrali mediocriter arcuato; ligamento oblongo intra nates attenuato; pagina interna valde concava, albida, maculis radisque purpureis ornata; dente mediana valvæ dextræ duplici, dentibus lateralibus brevibus serrulatis.

Long. 8, lat. 10, diam. 5·5 mm.

*Hab.* Near Quilon, in (probably brackish) ponds.

The author adds a note to his description from which the following may be quoted:—"The younger shells are more gibbous towards the umbones in proportion to their length than the larger specimens. A tawny-yellow epidermis covers the fresher specimens. The rays are numerous, more or less broad, sometimes appearing as mere lines of small spots, and occasionally spreading so as to make the surface appear nearly black. . . . . The shortness of the lateral teeth, on the anterior side especially, is a notable character, as well as the inæquilateral form, which is more conspicuous in the young than in the adult shell."

### 358. *Corbicula alberti*, Preston, nom. nov.

*Corbicula violacea*, Clessin, in Martini & Chemnitz, 1879, pp. 180-181, p. 30, figs. 18, 19.

Shell small, almost equilateral, swollen, fairly thin, polished, shining, strongly and distantly ribbed, covered with a dark olive-brown periostracum; anterior side scarcely attenuated, rounded; posterior side dilated, truncated; vertical transverse section cordate; horizontal contour ovate; umbones broad, inflated,

prominent, eroded; anterior margin rounded, gradually passing into the lower margin; ventral margin much arched; posterior margin curved, somewhat truncated; ligament short, thin; ligamental sinus shallow, slightly rounded; escutcheon and lunule absent; interior of shell polished only at the margins; nacre dark violet; hinge margin narrow; lateral teeth long, the anterior longer than the posterior, the inner almost uniting with the outer, those portions bordering on the cardinal teeth somewhat swollen, the swelling increasing very gradually; muscle and mantle scars shallow.

Long. 17, lat. 19, diam. 12 mm.

*Hab.* ? India.

Type in Sandberger Coll., Würzburg.

The name "*violacea*" having been already used by Prime in the genus, it becomes necessary to substitute another, hence that now given to the present species.

### 359. *Corbicula inflata*, Clessin.

*Corbicula inflata*, Clessin, in Martini & Chemnitz, 1879, p. 179, pl. 31, figs 14, 15.

Shell of medium size, solid, much inflated, almost equilateral, sculptured with polished, strong, somewhat distant, concentric riblets, covered with a yellowish-brown periostracum; anterior side short, scarcely attenuated; posterior side broadly truncated; umbones broad, much inflated, very prominent, strongly recurved; vertical transverse section broadly cordate; horizontal contour roundly ovate; anterior margin somewhat curved towards the lower margin, sharply rounded, gradually passing into the strongly arched lateral margin; posterior margin somewhat curved, gradually passing into the lower margin; escutcheon and lunule scarcely noticeable; ligament short, very strong; ligamental sinus shallow, angularly notched; interior of shell polished only at the margins, nacre pale violet; hinge margin fairly strong; cardinal teeth solid, much elevated, furrowed above; lateral teeth very long, the anterior much longer than the posterior; margin of the hinge much dilated in the vicinity of the two cardinal teeth; muscle-scars shallow.

Long. 32, lat. 36, diam. 24 mm.

*Hab.* India.

Type in Sandberger Coll., Würzburg.

### 360. *Corbicula picta*, Clessin.

*Corbicula picta*, Clessin, in Martini & Chemnitz, 1879, p. 179, pl. 31, figs. 12, 13.

Shell small, somewhat inequivalve, slightly inflated, moderately solid, strongly concentrically ribbed, the ribs being rather closely-set, slightly shining, covered with a dark-green periostracum and ornamented with black, radiate bands running from the umbones

to the outer margins, the umbones themselves being of a reddish colour; anterior side short, broadly rounded; posterior side broad, somewhat truncate; vertical transverse section narrowly cordate; horizontal contour almost cordate; umbones large, fairly prominent, much eroded; anterior margin somewhat curved, rounded, gradually passing into the ventral margin; ventral margin slightly arched; posterior margin strongly curved, separated from the ventral margin by a distinctly marked, somewhat rounded angle; ligament short, somewhat thick; ligamental sinus very shallow, slightly notched, elongate; interior of shell dull, except at the outer margin where it is polished, violet coloured; hinge margin rather narrow, bearing three cardinal teeth, the two posterior comparatively strong, grooved above, the third or anterior one very weak; lateral teeth long, somewhat curved; muscle scars very shallow; mantle scar distinct.

Long. 21, lat. 22, diam. 14 mm.

*Hab.* ? India.

Type in Sandberger Coll., Würzburg.

### 361. *Corbicula indica*, Clessin.

*Corbicula indica*, Clessin, in Martini & Chemnitz, 1879, pp. 143-144, pl. 25, figs. 21-23.

Shell of medium size, slightly inflated, solid, somewhat inequilateral, with glossy, strongly ribbed surface, the ribs somewhat close and acute, covered with an olive-green periostracum and painted with dark spots; growth striæ not distinct; anterior side somewhat shortened and pointed, posterior side slightly elongated, truncate; umbones large, scarcely prominent, very slightly recurved, eroded; vertical longitudinal section broadly lanceolate; vertical transverse section very narrow, cordate; horizontal contour triangularly ovate; anterior margin somewhat roundedly pointed; lower margin strongly curved; posterior margin forming a somewhat broad and short beak considerably roundedly angled on both sides; escutcheon and lunule scarcely visible; ligament short, fairly strong and prominent; ligamental sinus short, shallow triangular; interior of shell dull, the outer margin only slightly polished, tinged with violet, dorsal or hinge-margin white; cardinal teeth not divergent; lateral teeth very elongate and finely ribbed, equally strong over their whole length, the anterior much stronger than the posterior; muscle and mantle scars both shallow.

Long. 23, lat. 28, diam. 15 mm.

*Hab.* ? India.

Type in Gruner Coll., No. 518.

### 362. *Corbicula regia* (Benson MS.), Clessin.

*Corbicula regia* (Benson MS.), Clessin, in Martini & Chemnitz, 1879, p. 267, pl. 43, fig. 5.

Shell small, ovate, solid, much inflated, very inequilateral, with



strong fairly distant ribs, periostracum yellowish-brown; anterior side elongated, pointedly rounded, posterior side much shortened, obtuse, umbones much inflated, prominent, generally eroded; upper margin curved, gradually passing into the side margins; anterior margin narrow, rounded, gradually passing into the much arched and long ventral margin; posterior margin slightly curved and merging into the dorsal and ventral margins; ligament short, fairly strong and prominent; interior of shell dull, nacre white, marked with fine narrow brown rays, of which three are equally divided over the surface, running from the umbones to the ventral margin, while the remaining two run towards the hinge-margin, terminating at the lower side of the latter; hinge-margin fairly broad; cardinal teeth small, not grooved above; lateral teeth elongated, depressed, the posterior being shorter.

Long. 9, lat. 10, diam. 8 mm.

*Hab.* ? India.

### 363. *Corbicula nœtlingi*, v. *Martens*.

*Corbicula nœtlingi*, v. Martens, Arch. Natg. Berlin, lxv, 1899, p. 47, pl. 4, figs. 7-9.

? *Cyrena moussoniana* (Deshayes), Sowerby in Reeve, Conch. Icon. xx, 1878, pl. 17, fig. 97 (non *moussoni*, Desh., Cat. Brit. Mus., Conchif. 1854, p. 227).

Shell posteriorly elongated, in form somewhat resembling *Venus* or *Tapes*; dorsal margin descending more obliquely anteriorly than posteriorly; anterior margin rounded; posterior margin rounded above and below, vertically descending in the median region; ventral margin moderately rounded; concentric ribs strong, narrow, half the breadth of the spaces between, anteriorly and posteriorly becoming gradually reduced to slight striæ; hinge strong; lateral teeth long, the anterior one bent at the anterior end, the posterior one fairly straight; interior of shell bright violet.

Long. 22, lat. 29, diam. 14 mm.

*Hab.* Hpaung, N. Shan States (in a small pool).

The author mentions a small variety which is still more posteriorly elongated and rounded (fig. 7 in the reference to the original description quoted above).

Long. 16, lat. 22, diam. 11 mm.

*Hab.* Bakmio.

### 364. *Corbicula arata* (Sowerby).

*Cyrena arata*, Sowerby, Conch. Icon. xx, 1878, pl. 17, fig. 93.

*Original description*:—Testa ovata, tenuissima, rosacea, tumidissima, liris magnis, distantibus ad latera suboblique terminantibus rugata, epidermide aurantio-flavida induta; latere antico rotundo,

valde inflato; latere postico magis producto, subattenuato, anguste truncato.

*Hab.* Tenasserim.

The dimensions of a specimen in the British Museum are:—

Long. 14, lat. 17, diam. 11 mm.

A pale, uniform greenish-yellow shell ornamented with distant, concentric riblets; somewhat elongately ovate and considerably inflated, especially remarkable for its thin texture.

### Subfamily SPHÆRIINÆ.

Shell small, ovate or trigonal, lateral and cardinal teeth more or less developed, ligament external; pallial line entire.

*Distribution.* World-wide.

### Genus SPHÆRIUM.

*Sphærium*, Scopoli, 1777; Scopoli, *Introduct.* p. 397.

*Chama*, d'Argenville, *Hist. Nat. Lithol. Conchyl.* no. 9, 1742, pp. 368, 374, pl. 31.

*Tellina*, Linnæus; Linn. *Syst. Nat.* 10th ed. i, 1758, p. 678.

*Cardium*, DaCosta, *Brit. Conch.* 1778, p. 173, pl. 13, fig. 2.

*Cyclas*, Bruguière, *Encycl. Méth.* 1792, pl. 301.

*Nux*, Humphrey, *Mus. Calonn.* 1797, p. 59.

*Musculium*, Link, *Coll. Univ. Bost.*, pt. 3, 1807, p. 151.

*Cornea*, Megerle, *Mag. Gesell. Naturf. Berlin*, v, 1811, p. 56.

*Corneocyclas*, Férussac, *Dict. Sci. Nat.* xii, 1818, p. 277.

*Amesoda*, Rafinesque, *Ann. Gén. Sci. Phys. et Nat.* v, 1820, p. 310.

*Cycladites*, Krüger, *Gesch. Urwelt.* ii, 1823, p. 469.

*Pisidium*, Verany, *Descris. Genova*, ii, 1846.

*Type*, *Sphærium corneum*, Linn.; Europe.

*Range.* World-wide.

Shell thin, ovate, convex, subequilateral, covered with a fine periostracum, smooth or concentrically striate; umbones lightly anteriorly inclined; anterior side rather shorter than the posterior; margins of the valves simple; cardinal margins thin; cardinal teeth small, that in the right valve often bifid, fitting between two oblique teeth in the left; both anterior and posterior lateral teeth compressed, divergent, somewhat projecting, lamelliform double in the right valve, single in the left; ligament external, weak, scarcely apparent; pallial line entire.

Animal having the edge of the mantle smooth; foot tongue, capable of considerable extension; siphons moderately long, united at their base, separated at the end; the branchial siphon somewhat the longer and broader; siphonal orifices simple; palpes triangular, lanceolate; gills unequal, the outer the shorter and fringed.

365. *Sphærium avanum*, Theobald.

*Sphærium avanum*, Theobald, J. A. S. B. 1873, xlii, pt. 2, p. 209, pl. 17, fig. 6.

*Original description*:—Testa quadrata rotunda, tumida, antice rotundata, postice truncata, dilatata, equilaterali. Epidermide, leviter et concentrice corrugata, postice levissime radiata. Umbonibus prominentibus, tumidis, osculantibus; colore pallide stramineo, tribus fasciis purpureis umbonalibus radiatim picto. Ligamento umbones versus inflato.

Long. 6·6, lat. 7·5, diam. 5·2 mm.

*Hab.* Near Ava.

366. *Sphærium indicum* (Deshayes, MS.), A. Adams.

*Sphærium indicum* (Desh. MS.), A. Adams, P. Z. S. xxii, 1854, p. 342, & Cat. Brit. Mus., Conchif. p. 265.

*Cyclas indica*, Deshayes, H. & T., C. I. pp. 62–63, pl. 155, fig. 9.

*Original description*:—Testa ovato-rhomboidea, tumidula, æquilateralis, tenui, pellucida, albo-grisea; latere antico late rotundato, postico obtuse truncato; umbonibus tumidis, parum prominentibus; cardine obsolete bidentato, dentibus lateralibus candidis, antico majore, trigono, acuto, postico paulo brevior, valvis sub lente tenuissime striatis.

No dimensions, habitat, or figure are given with the above description, but the habitat attached to the types is "Loodiana, Punjab," and that given in the Conch. Ind. "Moradabad"; the following dimensions are taken from three specimens of the type series in the British Museum:—

	1.	2.	3.
Long. ....	5·25	5·5	4·75 mm.
Lat. ....	6·25	6·25	5 mm.
Diam. ....	3 5	3·75	2·75 mm.

Genus **PISIDIUM**.

*Pisidium*, C. Pfeiffer, Naturgeschichte deutscher Land- und Süsswasser-Mollusken, i, 1821, p. 123, pl. 1, fig. 19, ii, 1825, p. 33; iii, 1828, p. 68.

*Tellina*, Muller, Verm. ii, 1774, p. 205.

*Sphærium*, Scopoli, Introduct. 1777, p. 397.

*Cardium*, Poli, Test. Sicil. i, 1791, p. 65, pl. 16, fig. 1.

*Cyclas*, Draparnaud, Tabl. Moll. 1801, p. 106.

*Pera*, *Cordula*, Leach, in litt. in Mus. Brit. 1818–20.

*Phymesoda*, Rafinesque, Ann. Gén. Sc. Phys. et Nat. v, 1820, p. 319.

*Gallileja*, Costa, Corrisp. Zool. 1839.

*Pisum*, Gray (non Megerle), P. Z. S. xv, 1847, p. 184.

*Musculium*, Gray (non Link), 1851.

*Pisum*, Deshayes (non Megerle), Cat. Brit. Mus., Conchif. 1854.

*Musculium*, H. & A. Adams (non Link).

*Pisum*, H. & A. Adams (non Megerle), Gen. Rec. Moll. ii, 1858.

TYPE, *Pisidium annicum*, Jenyns, from Europe and Northern Asia.

*Range.* World-wide.

Shell small, roundly ovate or obliquely wedge-shaped, inequilateral; anterior side longer than the posterior; umbones slightly inflated behind; hinge bearing two cardinal teeth in each valve: right valve bearing four laterals and the left valve two; lateral teeth strong; ligament situated on the *smaller* (posterior) side; pallial line entire.

Animal having the mantle lobes smooth and open; furnished with a single short (anal) siphon, with non-papillary orifice; branchial cavity indistinguishable from the pedal cleft; foot large, tongue-shaped, capable of great extension; palpes triangular, elongated.

367. *Pisidium clarkeanum*, G. & H. Nevill.

*Pisidium clarkeanum*, G. & H. Nevill, J. A. S. B. xl, 1871, p. 9, pl. 1, figs. 4, 4 a-4 d.

*Original description*:—Testa ventricosa, oblonga, valide inæquilateralis, pallide fulva; postice elongata ac rotundata, antice rotundate truncata; umbonibus prominentibus ac tumidis; superficie concentric confertim striata, striis tenuibus, regularibus.

Long. 4·5, lat. 5·5, diam. 8·5 mm.

*Hab.* Tanks, etc., close to the Damuda at Moiraka.

368. *Pisidium hydaspicola*, Theobald.

*Pisidium hydaspicola*, Theobald, J. A. S. B. xlvii, 1878, p. 147.

*Original description*:—Testa sub-cordate ovali tenui, exilissime striata, antice rotundata, postice vix truncata.

Long. 3·4, lat. 4, diam. 2·5 mm.

*Hab.* Kashmir, near Shypion.

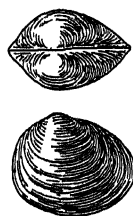


Fig. 27 — *Pisidium hydaspicola*, Theob (Type.)  $\times 4$ .

To the above scanty description is added the following note:—  
“The nearest ally of this species is *P. clarkeanum*, Nev., but it more rounded in front and hardly truncated behind.”

The type is in the British Museum.

369. *Pisidium bombayanum*, Theobald.

*Pisidium bombayanum*, Theobald, J. A. S. B. xlv, 1876, p. 188.

*Original description*:—Testa subovali, tumida, tenui, inæquilaterali, postice rotundata, vix truncata; antice rotundata elongata; exilissime et confertim concentrice striata; dente

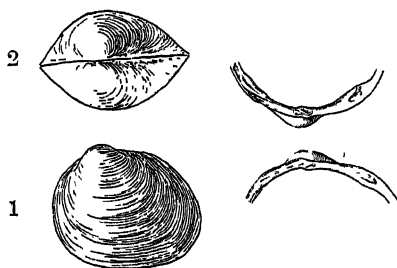


Fig. 28 - 1 & 2. *Pisidium bombayanum*, Theob. (Type)  $\times 3$   
3. Hinge of the same.  $\times 3$ .

cardinali minutissimo; dentibus lateralibus in valva dextra geminis, in sinistra autem singulis.

Long. 3·70, lat. 4·30, diam. 2·70 mm.

*Hab.* Western Ghats (*W. T. Blanford*).

Type in the British Museum.

370 *Pisidium atkinsonianum*, Theobald.

*Pisidium atkinsonianum*, Theobald, J. A. S. B. xlv, 1876, p. 189.

*Original description*:—Testa subovali, vix tumida, inæquilaterali,



Fig. 29 — *Pisidium atkinsonianum*, Theob. (Type.)  $\times 4$

antice elongata, utrinque rotundata, tenui, pallide cornea, concentrice striatula; et lineis paucis (4-5) incrementi fortioribus signata.

Long. 2·70, lat. 3·30, diam. 1·80 mm.

*Hab.* Tonglu, Sikkim, at an altitude of 10,000 ft. (*W. S. Atkinson*).

The following note is appended to the description:—"Compared with *P. bombayanum* this is a smaller, flatter and less inequilateral shell. . . ."

Type in the British Museum.

**371. *Pisidium nevilleianum*, Theobald.**

*Pisidium nevilleianum*, Theobald, J. A. S. B. xlv, 1876, p. 188.

*Original description*:—Testa trigona, tumidiuscula, tenui, inæquilaterali, postice modice convexa, antice elongata, sub-acuminata, exilissime concentricè striata; umbonibus lævigatis.

Long. 3.50, lat. 3.60, diam. 2.20 mm.

*Hab.* Near Rurki.

Appears to be chiefly distinguishable from its allies by its trigonal form.

**372. *Pisidium stewarti*, Preston.**

*Pisidium stewarti*, Preston, Rec Ind. Mus., Calcutta, iii, 1909, p. 116 (fig. in text)

*Original description*:—Shell sub-trigonal, rather inflated, pale yellowish brown colour, marked with fine concentric lines of growth; umbones large; anterior lateral teeth somewhat curved with broad grooves between, posterior lateral teeth broad and somewhat projecting in right, strong and sharply curved in left valve.

Long. 2.25, lat. 3 mm.

*Hab.* High Hill, Gompa, Gyantse Valley, Tibet, in a small stream, among moss and stones, 14,500 feet.

The type-specimen is in the Indian Museum, Calcutta.

Two specimens only were obtained by Capt. F. H. Stewart, I.M.S.; its nearest ally would appear to be a fossil species from the tertiary deposits of Belgium\*, there being no known recent form resembling it.

**373. *Pisidium zugmayeri*, Weber.**

*Pisidium zugmayeri*, Weber, Zool. Jahrb. Jena, xxix, 1910, pp. 310-311.

*Original description*.—Testa flavescens, satis solida, inæquilatera, orbiculato-ovalis, parte posteriore abbreviata, obtusa, ventriosula, tenuissime striata, sulcis post intervalla interpositis, lineis incrementi signata; umbones versus marginem posteriorem siti, rotundati, prominuli; dentes cardinales valvæ sinistræ bini, ante umbones, superior (exterior) fere rectus, tenuis, media parte

\* *P. vincentianum*, B B Woodward, Cat. Brit. Spec. *Pisidium* in Coll. Brit. Mus., 1913, pp. 127-128

inferiorem (interiorem) tegens, inferior crassior, prope dentem lateralem anticum, haud curvatus, altior exteriore; dextræ singuli; paulum curvati, parte sinistra ascendente tenues, parte dextra descendente incrassati; dentes laterales in valva sinistra bini, erecti, antice triangulati; postice uncinati, valva dextra bini postici et bini antici, bini exteriores (non semper exstantes) minimi; interiores longi, triangulati. antice crassiores.

Affinis *Pis. scholtzii*, Clessin\*, differt forma dentium cardin. valvæ sinistræ, situ dentium cardinalium, minore profund.

*Hab.* Lake Walar, Kashmir.

The author appears to have only been able to see two perfect specimens which were both very young, he therefore gives the following measurements taken from a series of single valves :—

		1.	2.	3.	4.	5.	6.
Six Right Valves.	Long. . .	3	3	3	2.7	2.6	— mm.
	Lat. . .	3.5	3	3.2	3	2.9	3.4 mm.
	Diam. . .	1	1	1	1	1	1.1 mm.
Three Left Valves.		1.	2.	3.			
	Long. . .	2.7	3	2.4 mm.			
	Lat. . .	3	3.1	2.8 mm.			
	Diam. . .	1	1.1	1 mm.			

The proportion between length and breadth is therefore 3:1 to 2.8.

## Family SOLENIDÆ.

### Subfamily SOLENINÆ.

Shell equivalve, transversely elongate, more or less gaping at each end, covered with a periostracum; umbones not prominent; ligament external, on an elongate ridge; hinge very variable, bearing from one to three cardinal teeth on each valve; lateral teeth wanting; adductor scars in both valves distant; pallial impression posteriorly more or less sinuous, pedal impressions well marked beneath the umbones or near the dorsal margin; external surface of the shell presenting a well-defined cellular structure, consisting of long prisms, very oblique in relation to the surface and showing the presence of nuclei; internal surface nearly homogeneous; non-nacreous.

Animal, with the exception of *Novaculina*, marine or estuarine; siphons usually short, in part united or entirely separate; foot large, powerful, more or less cylindrical, elongated; without any trace of byssogenous organs; palpes variable in size; gills straight, unequal, lengthened and enclosed in the branchial siphon.

*Distribution.* World-wide.

\* *P. scholtzii*, Clessin = *P. obtusale*

Genus **NOVACULINA.**

*Novaculina*, Benson, Glean. Science, Calcutta, ii, 1830, p. 63.

TYPE, *Novaculina gangetica*, Benson; Rivers Jumna, Gumti, and Ganges.

Range. Ganges System; Andaman Islands.

*Original description*:—Shell subinequivalve, inequilateral, transversely elongated; ligament external, communicating with the interior of the shell by an oblique channel. Beaks prominent. Hinge-line nearly straight. Two narrow entering teeth under the beak in one valve, generally three in the other. Syphonal scar very long. Extremities of the shell gaping. Epidermis easily detached when dry, folding over the edges and extremities of the shell, and connecting the hinge-margins. Interior glossy or dull, never pearly.

*Animal*. Mantle with the basal-edges united, forming a tube which encloses the animal, longitudinally constricted at the suture. Foot proceeding from the anterior extremity, short, thick, cylindrical, and very muscular; enlarged at the extremity into a disk, with a convex surface, the plane of which is at right angles with the axis of the foot and shell. Syphons separate, as long as the shell, when fully extended; the anal one, or that nearest the hinge, half the thickness of the other; apertures constricted, not ciliated.

374. *Novaculina gangetica*, Benson.

*Novaculina gangetica*, Benson, Glean. Science, Calcutta, ii (1830, Feb.), p. 63 (as genus *Novaculina*); A. M. N. H. ser. 3, i, 1858, pl. 12 B, fig. 4; II. & T., C. I 1876, p. 47, pl. 116, fig. 7.

*Novaculina novaculina*, Gray, A. M. N. H. xiv, 1854, p. 24

*Solecurtus novaculina*, Reeve, Con. Icon. 1874, pl. 7, figs. 31 a & b.

*Tagelus gangeticus*, Clessin, in Conch. Cab. 1888, pp. 81-82, pl. 23, fig. 6.

*Original description*:—Shell oblong, with truncated extremities, white, slightly violaceous internally, epidermis olivaceous.

The above meagre description was supplemented later\* by Benson as follows:—"Epidermis easily detached when dry, folding over the edges and extremities of the shell, and connecting the hinge-margins."

No measurements being given by the author, the following are taken from three authentic specimens in the British Museum:—

	1.	2.	3.
Long. ....	9.25	8.75	7 mm.
Lal. ....	25	20.5	19 mm.
Diam. ....	6	6	5 mm.

*Hab.* Rivers Jumna, Gumti, and Ganges.

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\* A. M. N. II. ser. 3, i, 1858, pp. 409-410.



375. *Novaculina andamanensis*, Preston.

*Novaculina andamanensis*, Preston, Rec. Ind. Mus., Calcutta, ii, p. 209, pl. 16, fig. 40.

*Original description*:—Shell oblong, elongate, inequilateral, constricted towards the middle, pure white, bearing traces of having been covered with a yellowish-brown periostracum, concentrically striate; dorsal margin slightly sloped anteriorly; ventral margin excavated in the middle, anterior side rounded; posterior side produced, somewhat angled below; umboes small.

Long. 16·5, lat. 37·5 mm.

*Hab.* Andaman Islands.

The type is in the Indian Museum, Calcutta.

The specimens on which the above species was based were collected in the Andamans by the late Rev. J. Warneford. It would seem to be scarce as, though several collections of Andaman Island material have since passed through the hands of the compiler of the present volume, no further specimen has come to light.

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